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By the same Author.

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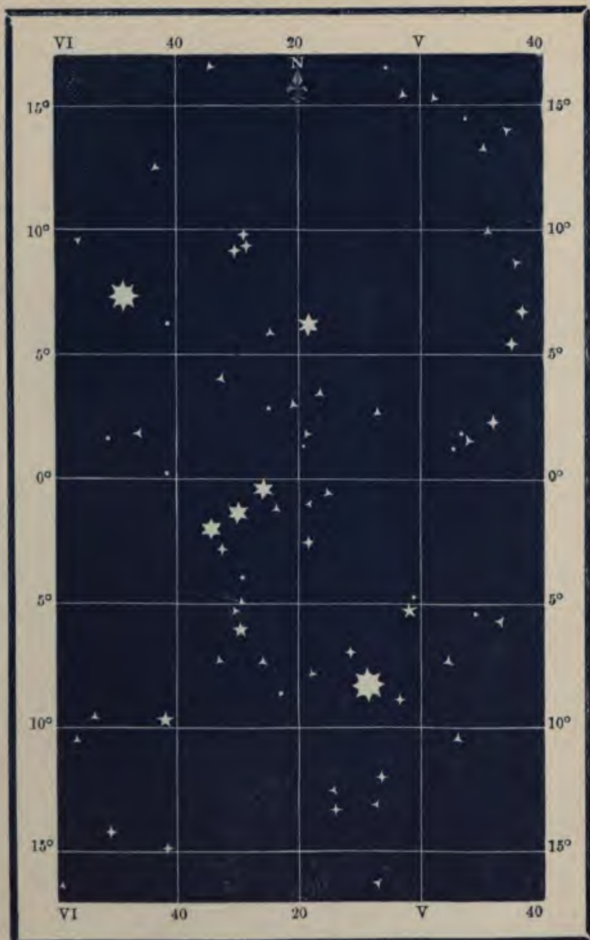

ORION.

MAP I.

THE HANDBOOK OF THE STARS:

CONTAINING

THE PLACES OF 1500 STARS, FROM THE FIRST TO THE FIFTH MAGNITUDE INCLUSIVE, UPWARDS OF 200 OF WHICH ARE NOTED AS DOUBLE, MULTIPLE, OR VARIABLE; A LIST OF STAR-NAMES; A TABLE FOR DETERMINING THE POSITION OF THE CONSTELLATIONS ON THE CELESTIAL CONCAVE AT ALL HOURS AND SEASONS, AND OTHER USEFUL TABLES.

WITH

AN EXAMINATION OF THE PROPERTIES OF THE PROJECTIONS USED IN MAPPING; AND HINTS ON THE SELECTION, USE, AND CONSTRUCTION OF STAR-MAPS.

BY

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ILLUSTRATED BY MAPS AND DIAGRAMS.

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PREFACE.

I HAVE endeavoured to make this treatise, as its name implies, a really useful handbook of reference for the student of astronomy. The tables which form the bulk of the work were drawn up at different times for my own use. The catalogue of 1500 stars, for instance, is the list I have made use of in the construction of my Gnomonic Maps of the Stars*; and the table of precessional variations is reduced from a more complete table which I drew up to determine what portion of the annual variation of each star's place is due to the star's proper motion. These tables have, however, many other uses besides those which they were originally intended to subserve. In the opening pages of the work their nature is fully explained.

Of the stars in Table I. about 200 are noted as double, multiple, or variable.

From Table VI., as explained in Chapter IV., the appear-

* I take this opportunity of noting an error in the introductory pages of that work—the places of 1500 stars from the first to the fifth magnitude inclusive have been calculated from the 'British Association Catalogue' of 8377 stars, not from the smaller catalogue of the Royal Astronomical Society.

ance of the nocturnal skies at successive hours, in all parts of the year (in England), can be determined. This is perhaps about as much as can be done by tabular or verbal statement. But it is clear that properly constructed maps, giving the arrangement of the constellations to every second hour (or even to every third hour only), would more effectively subserve the purpose in view. Since Table VI. was in type, I have learned that Mr. Alexander Herschel has constructed (for the use of the British Association Shooting-star Committee) a series of twelve maps, giving the appearance of the heavens, to within a few degrees of the horizon, for every second hour all the year round. I have not seen the maps themselves (which have not been regularly published), or any detailed account of them, but I gather from the brief sketch I have seen, that they are constructed on the gnomonic projection. Hence, since they include so large a part of a hemisphere, the distortion must necessarily be very great round the edges of the maps, and the scale of the undistorted central part must be very small compared with the actual dimensions of the maps. Of course these disadvantages are as nothing compared with the great advantage (for the special purpose to be subserved by Herschel's maps), that the allineations of the stars are preserved in gnomonic maps. But it has occurred to me that a corresponding series of very useful small maps might be formed on the equidistant projection, or rather construction, and I am, accordingly, preparing a series of twelve such maps. I am not sure but that the equidistant is in all cases the best available construction for the map of a

complete hemisphere; but whether it is so or not, it seems quite clear to me that, for the purpose in view, equidistant maps are superior to maps on any other construction. The main point to be secured in such maps is *simplicity of interpretation*, and nothing can be simpler than the interpretation of an equidistant map; for, the centre of such a map being the zenith-point of the observer (in England), the map gives correctly the *zenith-distance* and *bearing* of each star visible above the horizon at the hour corresponding to the map. If, for instance, a star is marked in half-way between the centre of the map and the circumference, and in a given direction with respect to the cardinal points marked round the map, it is to be understood that the star is to be looked for in that direction, half-way between the zenith and the horizon (that is at an angle of 45° above the horizon). From a series of such maps more can be learned in a few minutes of the actual hourly and annual variations in the appearance of the skies than from many hours' study of the best verbal description.

A mere acquaintance with the configuration of the constellations, and with the names of stars, is not perhaps a very important acquisition. Milton, it is true, has included among the pleasures of a hermit's life, that he (said hermit)

> May sit and rightly spell
> Of every star that Heav'n doth show,

with the result that

> Old experience shall attain
> To something like prophetic strain;

but modern observers are expected to do something more. There are so many persons, however, who seem to find a

difficulty in attaining even this moderate amount of astronomical knowledge, that maps or tables would not be altogether useless if they served only to remove this difficulty; and, certainly, if no great credit is to be claimed for a knowledge of the constellations, or of single stars, it is at least not desirable that any educated person should be (as many are) so ill-informed on these points that, if asked to point out some noted star, they would answer as vaguely through ignorance, as Mr. Birdofredum Sawin did from design, who, we know, when asked by Black Pomp to point out the Pole-star,

> Weeled roun' about sou'west, an', looking up a bit,
> Picked out a middlin' shiny one an' tole him that wuz it.

But the sort of acquaintance with the heavens which could be gathered from Table VI., properly studied, or from the maps I have described—such an acquaintance, for instance, that the student should know the position and configuration of all the constellations above the horizon, at any hour of any day—is a really desirable and useful kind of knowledge.

I have entered at some length in Chapter III. on the question of the different modes of projection or construction used in mapping. The projections of the sphere have been treated in a somewhat novel manner. By projecting upon a tangent-plane, the central or undistorted parts are brought to the same scale in all the projections, and by placing in juxtaposition the principal projections of a strip of the sphere of known form, the advantages and defects of the different projections are made visible at a glance. One mode of projection, which I believe to be novel, a form of *equigraphic* projection,

is mentioned in passing, and illustrated with the others. For geographical purposes this method seems worthy of favourabie consideration. An examination of its properties, at any length, would have been out of place here, since the projection is clearly unsuited to the purposes of celestial maps. In a paper which I have prepared for the pages of the 'Intellectual Observer,' and which is now in type, I have more fully described and illustrated this and two other equigraphic projections, and pointed out certain subjects, such as the physical geography of the earth and ocean, the position of isothermal lines, and so on, which they seem calculated to illustrate more effectually than maps on other projections. The maps on Mercator's Projection, commonly used for these purposes, though admirably adapted to illustrate 'plane sailing,' seem quite out of place in geographical works, since they are calculated to give (and undoubtedly do often give) altogether erroneous notions of the configuration of continents and oceans.

I have examined the principles of the conical projection (or rather construction), and exhibited some simple methods by which the young student may mark down the meridians and parallels for star-maps on this projection. For fuller details —such modes of construction for instance as would be necessary for geographical maps on a large scale—the reader is referred to Professor Hughes' interesting work on the 'Construction of Maps.' I believe, by the way, that the application of the conical construction to mapping is due to this well-known geographer.

As respects the selection of modes of construction suitable for sets of star-maps, the conclusions expressed in the text are (i.) that the *equidistant* is the best projection for the map of a complete hemisphere; (ii.) that the *gnomonic* projection of the sphere, in twelve pentagonal maps, is the best method available for the construction of a set of popular star-maps; and (iii.) that the *stereographic* projection is the best for a celestial atlas.

Since the work has been in type, however, I have seen occasion to form a different view on the last point. Having drawn the meridians and parallels for stereographic maps on the plan described in note (*), p. 32, the variation of scale and area seemed too large to be neglected. I accordingly drew out, for the purpose of comparison, the corresponding meridians and parallels on the true equidistant projection, and came at once to the conclusion that this construction was to be preferred to the stereographic. The scale variation, instead of being from 1 to rather more than $1\frac{1}{9}$, is from 1 to less than $1\frac{1}{13}$; and the variation of area is the same, instead of being from 1 to $1\frac{1}{4}$. The maximum variation of small figures is scarcely perceptible. I believe a celestial atlas formed on the plan exhibited in the note referred to, but on the equidistant projection, and with meridians and parallels to every degree, would form a valuable addition to our scientific libraries.

I have spoken above of the equidistant projection. In reality the mode of construction referred to is not a projection. Its principle is simply this, that the *bearing* and *distance* (on

the arc of a great circle) of each point from the centre of the map, should be correctly presented. In some respects this principle of construction is superior even to the conical. It has the advantage of being a *central* construction, *easily interpreted* (in the manner already explained in another instance of the use of the construction) and *constant in its properties*, whatever the latitude of the central point; whereas the conical construction varies from latitude to latitude (as the vertical angle of the tangent-cone varies) and its properties vary accordingly. The conical construction has a great advantage, however, in simplicity of construction. The only method I know of for the construction of maps on the true equidistant construction, is to calculate the distance and bearing of the points of intersection of meridians and parallels, and to mark down corresponding points on the map, through which points the curves representing these circles are to be drawn. This at least is what I have done in preparing the meridians and parallels for the celestial maps referred to above. The calculation is *simple* enough, depending on the ordinary formulæ for the solution of spherical triangles, but rather laborious for maps on a large scale, in which great accuracy is required.* But when once the necessary calculations for one map have been effected, the meridians and parallels for all maps having their centre in the same latitude as the first are determined. It is a question whether the uniformity and the simplicity of

* It is clear that the meridians and parallels of an equidistant map are neither circular nor elliptic, but fall into less simple curves (transcendental curves, in fact).

interpretation of maps (geographical as well as celestial) so constructed would not be more than sufficient to compensate for the labour involved in calculating the positions of meridians and parallels.

RICHARD A. PROCTOR.

3, Collingwood Villas, Stoke, Devon :
July 1866.

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HANDBOOK OF THE STARS.

CHAPTER I.

CATALOGUE OF FIXED STARS.

Tables I. and II.

Table I. is a catalogue of 1,500 stars. It contains all the stars of the British Association Catalogue, from the first to the fifth magnitude, inclusive. The stars are collected in constellations which are arranged alphabetically, and the stars of each constellation are given in the order of their right ascensions.

The first column gives the number of the star in this Catalogue; the second gives the corresponding number in the British Association Catalogue; the third gives Flamsteed's number; the fourth Bayer's Greek letter, or any other letter by which the star is known; the fifth indicates the magnitude of the star according to the British Association Catalogue; the sixth notes if the star is double, or multiple, variable, nebulous, or the like; the seventh indicates the right ascension of the star, correct to one-tenth of a minute of time for the year 1880, and therefore approximately correct to the end of the

century; and lastly, the eighth column indicates the star's declination, correct to one minute of arc for the year 1880.

This table is intended to aid the student in using and interpreting star-charts, and to enable him to map out any part of the heavens with the appearance of which he may desire to become familiar. In works on astronomy reference is often made to the stars by their names, numbers, or letters only; in the public journals also when the appearance of a meteor or of a comet is noted, we often find the same sort of reference. The student who may wish to apply such a reference—for instance to determine the position of a comet among the stars, or to compare his own observation of a meteor with the recorded appearance,—may meet with some difficulty in finding on his star-charts the star or stars to which reference has been made. He has first to find the constellation, and then to search for the letter or number of the star. If his charts are large and complete, this operation may take some time; and if they are incomplete, the star he is in search of may not be indicated; or again, the star may not be indicated on the chart in the same way as in the reference. By means of Table I. the student will be enabled at once to find the right ascension and declination of any star likely to be referred to in the way described above, and thus to find the star in the chart, just as he would find a town in a geographical map from the longitude and latitude in the Index; or if the star is omitted in the chart he will be able to supply the omission. As star-charts usually include a large part of the celestial sphere and therefore necessarily exhibit considerable distortion and variation of scale, it will frequently happen that the student may desire to map down a smaller portion of the heavens than his charts include, so as to be able to indicate with more accuracy

the place of some nebula (suppose), or the predicted path of a comet or planet across that part of the celestial sphere. Methods of drawing the meridians and parallels for such maps are described in Chapter III.

It is clear that in a table intended for the purposes above indicated, the degree of accuracy necessary in catalogues meant for use in observatories, would be out of place. Such catalogues must be calculated to hundredths of seconds of time and tenths of seconds of arc, the annual variations of each star must be given with still greater accuracy, and the quantities necessary to reduce the calculated place of a star to the apparent place, must also be accurately stated. Catalogues so constructed, and containing the places of many thousands of stars, are—from the labour of forming them, chiefly, but partly, also, from the cost of printing them—necessarily expensive, as indeed they are highly valuable. But the degree of accuracy with which Table I. has been calculated is quite sufficient for the purpose the table is intended to subserve. For a table giving right ascensions to the nearest tenth of a minute of time, cannot be in error by more than one twentieth of a minute of time; and in like manner a table giving declinations to the nearest minute of arc cannot be in error by more than one half of a minute of arc. Now, supposing a star to be on the equator so that the minute of time has its greatest equivalent in space, being there equal to fifteen minutes of the arc of a great circle, then the greatest possible error of such a star as determined by Table I., is three-quarters of a minute of arc in right ascension, and one half of a minute of arc in declination; and two such displacements, in directions at right angles to each other, would give a total displacement of nine-tenths of a minute of arc. Now on a globe one yard in diameter

such a displacement would be represented by a space of less than $\frac{1}{210}$th of an inch; therefore even on a globe of these unusual dimensions the greatest possible error of the table would be inappreciable. The corrections due to the precessional motions of the stars, though small, are more noticeable; they may be effected by means of Table III. explained in Chapter II.

Many of the double stars included in this table are visible with telescopes of moderate power; others are more difficult; and some, either from the closeness or inequality of the component stars, are only visible in very powerful instruments. The Roman numbers from (i.) to (viii.) in order indicate that the distance between the components of a double star lies between 0″ and 1″, 1″ and 2″, 2″ and 4″, 4″ and 8″, 8″ and 12″, 12″ and 16″, 16″ and 24″, and 24″ and 32″, respectively: the inequality of the components is indicated by the letter *u*.

TABLE II. is a list of names which have been given to some of the fixed stars. Most of these names are corruptions of Arabic words,—as Betelgeux from *ibt-al-jauza* 'the giant's shoulder.' Some stars have more than one name. Thus the star η Ursæ Majoris is called Alkaid and Benetnasch.* This

* I believe this name, Benetnasch, a corruption of the Arabic for 'sons of the bier,' is properly applicable to the three bright stars forming the Bear's-tail, collectively, and corresponds to the expression עיש על בניה (Job xxxviii. 32) translated the 'sons of Arcturus (Heb. Ash).' The seven bright stars of Ursa Major appear to have been compared to a bier followed by three mourners—in eastern phrase 'the bier and the sons of the bier.' The name Talitha, or 'daughter,' applied to the star ι Ursæ Majoris confirms this interpretation. Of course the name Arcturus (Job ix. 9, and xxxviii. 32), the 'Αρκτοῦρος of the Septuagint (in the same verses of Job, and also in Amos v. 8) was intended by the translator to represent the Great Bear, not Bootes or the star Arcturus. It should

peculiarity is in general due to the circumstance that some stars belonged to more than one constellation. Even in Bayer's Greek lettering this arrangement was continued,—so that, for instance, Bayer's stars δ Pegasi and γ Aurigæ do not appear in modern lists, being the same as α Andromedæ and β Tauri, respectively. Again some stars placed in similar parts of different constellations bear the same name. Thus the stars β Andromedæ and ϵ Bootis are both called Mirach, and both these stars as well as the star ζ Ursæ Majoris are sometimes named Mizar. There are three stars called Deneb ('the tail'), —viz., α Cygni, β Leonis, and δ Capricorni. The names Deneb Adige, Deneb Aleet, and Deneb Algiedi, respectively, are sometimes given in full,—by Deneb alone the star β Leonis is generally signified.

have been Arctos, the Bear. This word Ἄρκτος came to signify the North Pole, and I imagine that the translator, not being well acquainted with the constellations, used the word Arcturus (literally the Bear-guard) conceiving it to signify the Pole-ward, and therefore to represent the constellation Ursa Major.

CHAPTER II.

THE PRECESSION OF THE EQUINOXES.

Table III.

OWING to the slow precessional, or retrograde motion of the equinoctial points on the ecliptic, the right ascensions and declinations of the stars are subject to slow variation. Of course this variation does not correspond to any motions of the stars themselves: the point from which we estimate their positions is varying, and the quantities expressing their positions vary accordingly.

To illustrate the effects of precession in altering the right ascensions and declinations of stars:—

Suppose a globe, celestial or terrestrial, placed with its polar axis inclined about $23\frac{1}{2}°$ to the vertical, and assume the poles to be the poles of the ecliptic; let the uppermost point of the globe represent the north pole of the equator, so that the horizon circle represents the equator, the brass meridian the solstitial colure, and a circle at right angles to the brass meridian the equinoctial colure. Then if the globe were fixed and the other circles named were made slowly to *retrograde**

* That is, to move in such a manner that viewed from above the north pole of the ecliptic the motion would be that of *unscrewing*, or contrary to that of the hands of a watch.

about the polar axis, the *true nature* of the variation due to precession would be illustrated; but as regards the variation itself, we should clearly obtain as effectual an illustration by making *the globe progrede* about the polar axis. Now the actual change of position of each point on the globe due to a small motion of this kind is clearly equivalent to a small increase of longitude, the amount of which diminishes as the cosine of the latitude. But the north polar distances and right ascensions of points on the globe vary in a somewhat less simple manner. Taking first the north polar distance, it is clear that the solstitial colure divides the globe into two halves, in one of which all north polar distances increase, and in the other all north polar distances diminish for a small progressive motion of the globe. In that half of the globe (thus divided) which contains the rising node of the equator on the ecliptic all points are approaching the north pole, so that north polar distances are diminishing, and *vice versâ* in the other half. It is not so obvious, but may be readily proved, that along any meridian the variation of north polar distance for a given precessional motion is constant. There is clearly no change in the north polar distances of points situated on the solstitial colure; on the other hand, the variation has a maximum value for points situated on the equinoctial colure. As regards right ascension, it is clear that if the north poles of the equator and ecliptic coincided, a small progressive motion of the globe would increase the right ascensions of all points on the globe—just as the actual motion increases the longitudes; and the nearer the north pole of the ecliptic to the north pole of the equator the larger would be the surface of that portion of the globe in which right ascensions were increasing. Since the pole of the ecliptic is 23° 27′ 20″ from the pole of the equator, it follows

that over by far the larger part of the sphere right ascensions are increasing; but over two oval spaces, one between the northern poles of the equator and ecliptic and the other between the southern poles of these circles, right ascensions are diminishing (since it is clear that a forward motion round the pole of the ecliptic here produces a retrogression round the pole of the equator); while round the boundaries of these oval spaces* right ascensions remain unchanged.

TABLE III. gives the variation due to precession for points separated by arcs of 5° of right ascension and declination, all over the sphere. The following example will serve to illustrate the nature of the table, and the mode of using it:—

* It is easy to determine the figure of these spaces, whose boundaries are of course not plane curves, since the circle is the only plane curve that can be traced upon a sphere. Let a meridian and a longitude-circle be taken through a point on the boundary of the northern oval. Then, since this point is one whose right ascension remains unchanged for a small precessional motion, it follows that the motion of the point must carry it in the direction of the meridian described through the point, and since the point is moving in the direction of a small circle having the pole of the ecliptic as its pole the motion of the point is clearly at right angles to the longitude-circle through the point. Hence the meridian and longitude-circle through the point intersect at right angles. Now these two circles are gnomonically projected on the polar tangent-plane as two straight lines, passing through the poles of the equator and ecliptic, and intersecting at right angles,—intersecting, therefore, upon the circumference of a circle on the line joining these two poles as diameter. Hence this circle is the gnomonic projection on the polar plane of the boundary of the oval space on the sphere. This boundary is therefore the intersection of the sphere with an oblique cone, and may be described as a *sphero-ellipse* whose shorter axis is the arc of a great circle joining the poles of the equator and ecliptic. It may be added that the north polar distances of points on this curve are the complements of the south polar distances of the ecliptic on the same meridian, and may therefore be obtained from Table V.

The position of the ring-nebula 57 M. (in Lyra) for January 1*st.*, 1860, was—

R. A. $18^h\ 48^m\ 20^s$ N. P. D. $57^\circ\ 9'$;

it is required to apply the table to determine the position of the nebula for 1880, with as close a degree of approximation as is necessary for the purposes of a star-chart. From the lowest row of Table III. follow the vertical columns opposite 19h. 0m., and 18h. 40m., up to the horizontal rows through 55° and 60° of N. P. D. in the right-hand column. Thus we obtain the variations—

s	s	°
+ 2·32 2·16	+ 2·31 2·15	60 55
$19^h\ 0^m$	$18^h\ 40^m$	

Hence for N. P. D. 57° 9′ the variations are

| $+2^s{\cdot}23$ | $+2^s{\cdot}22$ |

respectively, and therefore for R. A. 18h. 48m. 20s. the variation is

$+2^s{\cdot}225$

which multiplied by 20 for the difference of years becomes

$+44^s{\cdot}5.$

Hence the required right ascension is

$18^h\ 48^m\ 20^s + 44{\cdot}5^s$, or $18^h\ 49{\cdot}1^m$.

For the North Polar distance we obtain from the table the variations

| $-5''{\cdot}2$ | $-3''{\cdot}5$ | *

* It is scarcely necessary to remark that of the two signs prefixed to the variations in declination, the upper corresponds to the right ascension immediately above, the lower to the right ascension immediately below.

corresponding to the right ascensions 19h. 0m., and 18h. 40m. respectively. Hence for 18h. 48m. 20s. the variation is

$$-4''\cdot 2$$

which multiplied by 20 becomes

$$-1'\ 24''.$$

Hence the required N. P. D. is

$$57^\circ\ 9' - 1'\ 24'', \text{ or } 57^\circ\ 8'.$$

corresponding to north declination 32° 52′.

By proceeding in this way the place of any nebula, or the path of a planet or comet, may be correctly indicated upon a map or globe of any date not differing more than 100 years either way from 1880.

Near the poles of the equator it is clear that a very small precessional motion corresponds to a large variation in right ascension, the arcs of right ascension being very small near the poles. It would have been useless, however, to carry the tabulation to the poles by single degrees or smaller distances, since the amount of variation would not remain constant for long intervals of time. As we very seldom require to determine the precessional variation of points lying within 5° of the poles, this irregularity is of little importance.

TABLE III. serves also for the conversion of North Polar distances into declinations, and of hours and minutes of right ascension into degrees.

CHAPTER III.

THE PROJECTION AND CONSTRUCTION OF STAR-MAPS.

Tables IV. and V.

SINCE the stars seem to be spread over the concave surface of the celestial sphere, they cannot be satisfactorily represented upon the convex surface of a globe. The star-groups must either be represented as they actually appear in the heavens, or in such a manner that they would appear in their just positions to an eye supposed to view them from the centre of the globe. The apparent distances of the stars from each other can be accurately given in either way; but the first brings the convexity of the globe into direct contrast with the concavity of the heavens; and the second (the method always adopted) reverses the positions of the star-groups as respects east and west.* Star-charts are therefore very necessary to the

* The change is not exactly the same as that which results when the stars are viewed through an astronomical telescope. Thus a group of stars, N, S, E, and W, which appears to the naked eye in the position $\begin{array}{ccc} & \mathrm{N} & \\ \mathrm{E} & & \mathrm{W} \\ & \mathrm{S} & \end{array}$, would be represented on a globe in the position $\begin{array}{ccc} & \mathrm{N} & \\ \mathrm{W} & & \mathrm{E} \\ & \mathrm{S} & \end{array}$, and would appear in an astronomical telescope in the position $\begin{array}{ccc} & \mathrm{S} & \\ \mathrm{W} & & \mathrm{E} \\ & \mathrm{N} & \end{array}$.

student who desires to become acquainted with the actual configuration of the constellations.

When any portion of a globe is represented upon a plane surface, such representation will exhibit some or all of the following defects,—distortion of large figures, distortion of small figures, variation of scale, and variation of area. The first and third defects are unavoidable, but are more sensible in some projections than in others. One or other of the second and fourth defects may be made wholly to disappear, but, of course, not both at once. The principal projections* of the sphere are the *gnomonic*, *stereographic*, *equidistant*, and *orthographic* projections. I propose to discuss the advantages and defects of each of these; to examine the methods which have been adopted for presenting the celestial sphere in a uniform set of maps; and, lastly, to point out a simple method of projecting the meridians and parallels for any small portion of the celestial sphere which the student may desire to map out for himself.

In fig. 1, p. 14, let P A S represent half a great circle of a sphere, of which G is the centre, and P S′ a tangent at P; so that, if the figure were to revolve about S P it would generate a sphere, and the tangent plane at P. Suppose the sphere to be marked with meridians and parallels (like a terrestrial or celestial globe) to every fifth degree. Then, since the spaces formed by these lines on a sphere have definite and easily determinable figures, we can obtain a convenient measure of the value of

* The term projection has come to be applied, in mapping, to any mode of construction founded on some definite geometrical principle. The strict definition of the term is as follows:—If from a fixed point lines be drawn to all the points of a given curve, the curve in which these lines meet a given surface, is the projection of the given curve on the given surface for the fixed point.

any method of projection by comparing the projected figures of these spaces with the actual figures on the sphere. For instance, assume the point of projection to be somewhere in the line P Q, and suppose A P to be a quadrant of the equator, divided by the meridians into eighteen parts, then we may compare the actual and the projected figures of the eighteen spaces which lie between the arc A P and a quadrant of the neighbouring parallel; or again we may suppose P to be a pole of the sphere, P A a quadrant of a meridian divided into eighteen parts by the declination-parallels, and we may compare the actual and projected figures of the eighteen spaces which lie between P A and a quadrant of the neighbouring meridian. It is clearly unnecessary to consider the variations of the figures of these spaces in more than one or two directions, *since in all axial projections the variation of scale and distortion of figure are the same along all radii from the centre of the projection.* Projections are usually supposed to be made on a great circle of the sphere, but as the gnomonic projection cannot be so made I shall consider all projections to be made upon the tangent-plane at the extremity of the axis of projection. Thus in fig. 1, the point of projection will assume successively different positions along P Q, and the plane of projection will be the tangent-plane at P. This method, though unusual, has one important advantage,—that the undistorted part of each projection (the part, namely, near the point P, which is called the *principal point*) is on the same scale in each projection, and that scale the scale of the globe itself.*

* The student will find a certain definiteness given to his notions of these projections, by considering the sphere as transparent, the meridians and parallels as opaque, the centre of projection as a brilliant luminous point, and the projection itself as the shadow of the meridians and parallels upon the tangent-plane at P.

FIG. 1. ILLUSTRATING THE PRINCIPAL PROJECTIONS OF THE SPHERE.

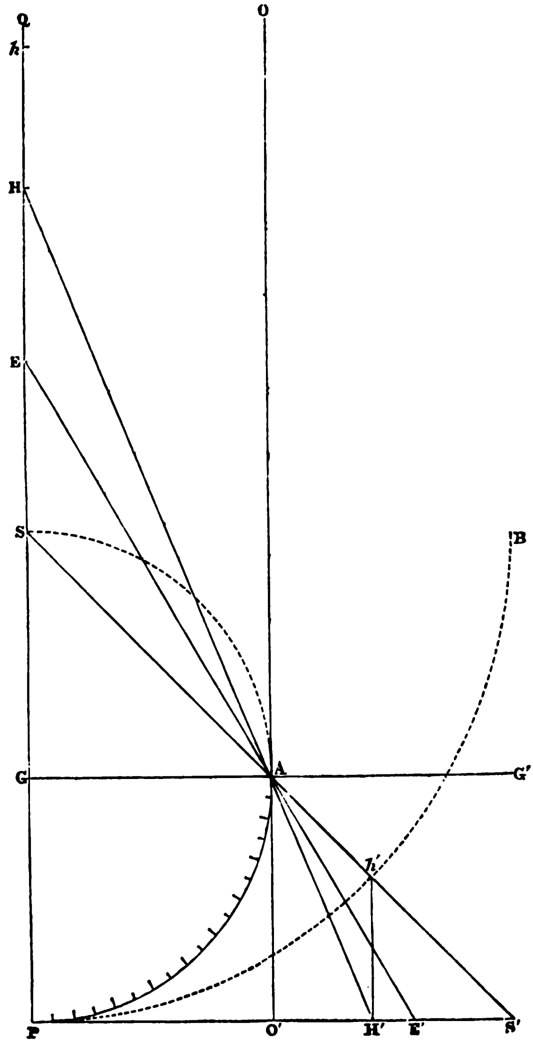
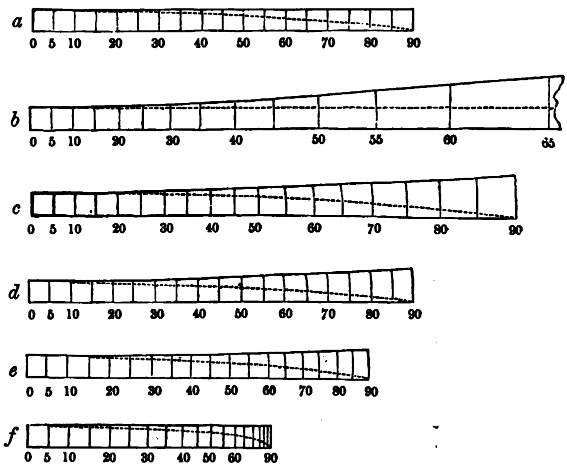


FIG. 2. ILLUSTRATING THE ADVANTAGES AND DEFECTS OF THE PRINCIPAL PROJECTIONS OF THE SPHERE.



a. A strip of the sphere between quadrants of the equator and of a declination-parallel 5° from the equator, crossed by parts of declination circles 5° apart.

b. Part of the same strip on the *gnomonic* projection, 0 being the principal point.

c.
d.
e.
f.
The same strip on the *stereographic* / *equidistant* / *equigraphic* / *orthographic* projection, 0 being the principal point.

Note. The dotted line in fig. *a* (taken with the base-line and the cross-lines) indicates the form of a strip between quadrants of two meridians 5° apart, crossed by parts of declination-parallels, 5° apart. The forms of the various projections of the same strip, are indicated in a corresponding manner by the dotted lines in figs. *b*, *c*, *d*, *e*, and *f*.

Two strips of a sphere corresponding to the two considered in the preceding paragraph, that is a strip five degrees broad along a quadrant of the equator, and a strip between quadrants of two meridians five degrees apart, are represented in Table IV. fig. 6. The first forms a row of eighteen squares, the second forms a lenticular figure divided into eighteen compartments,—whereof the lowest is a square, the uppermost an isosceles triangle, and the intermediate figures are quadrilaterals of varying form. Fig. 2 (*a*) exhibits the first strip reduced to the scale of fig. 1, and the dotted outline gives a sufficient approximation to the second strip.* With these strips, and the figures into which they are divided by the cross-lines, we can compare the corresponding strips and figures resulting from different modes of projection. A line drawn from the centre of projection (in P Q) through any division of the arc P A gives the distance from P of the cross-line corresponding to that division, and the length of the cross-line is determined by increasing the true length in the proportion of the whole length of the secant-line so drawn to that part of it which lies between the point of projection and the division-point in P A.

Proceeding from P towards Q, the first point we meet with suitable for a centre of projection is the point G, the centre of the sphere. A projection having this point as centre is called *gnomonic* from its relation to the art of dialling. Draw-

* In reality, of course, even such narrow strips of a globe are not developable, and the chord and arc of five degrees are not equal, as they are assumed to be in Table IV., and throughout the investigation in the text. Since, however, the arc of five degrees exceeds the chord by less than $\frac{1}{3000}$th part of either, the error, to all ordinary scales, is altogether inappreciable.

ing lines from G to the successive division points along P A, we find that the corresponding divisions along the projection of P A (which projection is, of course, a straight line) fall farther and farther apart, at first gradually, then more and more rapidly. Since G A is parallel to P S′, the projection of A does not fall on the plane of projection, a relation which is expressed by saying that the projection of A falls at an infinite distance from P. Thus a complete hemisphere cannot be represented on the gnomonic projection. The lengths of the cross-lines, determined as stated in the preceding paragraph, also increase, but not so rapidly as the distances between successive divisions. The first thirteen of the spaces corresponding to the squares of *a*, fig. 2, are exhibited at *b*. The dotted line parallel to the base-line marks the position of the meridian corresponding to the dotted meridian of *a*. It is clear that this projection gives a satisfactory delineation of those parts, only, of the globe which lie near the principal point. The greatest variation of scale lies in the direction of lines through the principal point, but there is considerable variation of scale in all directions for parts far removed from the principal point.

The gnomonic projection possesses several interesting geometrical properties. Since lines from the centre of a sphere to the circumference of a great circle lie in the plane of that circle, the projection of a great circle is the intersection of its plane with the tangent-plane of projection, and therefore is a straight line. It follows from this important property that the equator, ecliptic, meridians, and longitude-lines are all represented by straight lines in gnomonic star-maps; stars which appear to lie in the same straight line in the heavens will be in the same straight line in a gnomonic map; and, further, if we have obtained the projections of any two

points of a great circle, we obtain the projection of the circle by simply drawing a straight line through the two points. Lines from the centre of a sphere to the circumference of a small circle lie on a circular cone, so that the projection of a small circle is the intersection of a cone with the tangent-plane of projection, and therefore is one of the conic sections. If the whole of such a circle lie within the hemisphere nearest the plane of projection, it is clear that the projection is a closed curve, which (being a conic section) must be either a circle or an ellipse, according as the plane of the small circle is parallel or inclined to the tangent-plane. If part only of such a circle lie within the hemisphere nearest the tangent-plane, the projection will not be a closed curve. The part of the circle lying within such hemisphere will be projected into a curve extending indefinitely, and though in such projection as we consider in mapping the other part of the circle would not appear, yet the strict mathematical projection of this part would give another indefinitely extended curve. Therefore, since the projection is a conic section having two indefinite branches, it must be a hyperbola. In the intermediate case, in which a small circle touches the boundary of the hemisphere nearest the tangent-plane, the projection will be a single curve indefinitely extended, and therefore (being a conic section) will be a parabola. Thus we obtain the following rule,—the gnomonic projection of a small circle is an ellipse, a parabola, or an hyperbola, according as the distance of the nearer pole of the circle from the principal point, is less, equal to, or greater than, the complement of the spherical radius of the small circle; the projection reducing to a circle when the pole of the small circle coincides with the principal point.

The next point suitable for a centre of projection is S, the

extremity of the diameter P G S. A projection having this point as centre is called *stereographic*. Drawing lines from S to successive points along the arc P A, we find that the distances between successive points of division increase from the centre of the projection, but not nearly so rapidly as in the gnomonic projection. Since S A produced meets P S′ at a point S′ such that P S′ = 2 G A, the whole hemisphere is projected into a circle whose radius is twice that of a great circle of the sphere. The cross-lines (which are not straight as in the gnomonic projection) increase in length from the centre at the same rate as the spaces between successive divisions. The cross-line corresponding to the point A is clearly twice the length of the cross-line corresponding to the point P. Thus the eighteen spaces corresponding to the eighteen squares of *a*, fig. 2, are represented, as at *c*, by eighteen figures, not differing greatly from squares, but varying in size, the area of the greatest being four times that of the least.*

The stereographic projection possesses many elegant properties. Amongst these the principal are the following:—All circles, great or small, are projected into circles (excepting, of course, circles which pass through the centre of projection, which are projected into straight lines); intersecting lines on the sphere are projected into lines intersecting at the same angle; and very small figures on the sphere are projected into similar figures.† The first property is a useful one; since it follows

* The approximation of these figures to the square form depends on the properties examined in the following note.

† These properties may be very easily established. Thus suppose *c*, a point in P A (fig. 1), to be the pole of a small circle, and that A *c* P meets this circle in the points *a* and *b*, then lines from S to this circle lie on an oblique circular cone, and the intersection of the tangent-plane

that, if we can determine the projections of three points of any circle on the sphere, the circle described through those points is the projection of the circle. The other two properties are also very useful. The stereographic is, on the whole, the most valuable simple projection for mapping purposes.

The next point suitable for projection is the point E, so taken that SE is equal to half SA.* This point is selected with the following object,—that lines to the equidistant divisions of PA may meet PS′ in points as nearly equidistant as possible. If EA meet PS′ in E′, then a point from E to the bisection of the arc PA bisects the straight line PE′. For smaller divisions the law of equidistant division is not exactly fulfilled, and of course it is impossible to find any point which gives more than an approach to the law.† In the construction

at P with this cone is a circle, since the inclination of PS′ to Sb is equal to the sum of the angles SPS′, PSb, that is, to the sum of the angles SaP, Pab, or to the single angle Sab, so that the tangent-plane intersects the oblique cone in a subcontrary section. The second and third properties are also easily demonstrated; since they obviously depend on the property that the tangent-plane at any point c on the sphere and the tangent-plane at P are inclined to Sc at the same angle, the complement namely of the angle PSc. [To avoid confusion, some of the lines and points mentioned in this and other notes are not given in fig. 1.]

* A point distant from S (towards E) one-half the radius of the sphere, has been made use of by Colonel Sir H. James, but this projection possesses no properties deserving of particular comment.

† The problem of equidistant projection is very similar to that of equigraphic projection mentioned further on. We obtain, as in that case, not a single point of projection, but different points of projection along PQ for each small circle about P as pole. If θ be the spherical radius of such a circle, the formula giving x, the distance from G of the point of projection corresponding to that circle, is $x = r\,\dfrac{\sin\theta - \theta\cos\theta}{\theta - \sin\theta}$, r being the radius of the sphere. Thus it is easily determined that for

of maps the law is supposed to be strictly fulfilled, and the projection thus derives its name of the equidistant projection. Further, the ellipses into which circles on the sphere would in general be projected are replaced by circles. It is a portion of this modification of the true projection which is supposed to be represented at *d*, fig. 2; the base-line, being taken equal to P E′ in fig. 1, is divided into eighteen equal parts; the cross-line opposite O is taken equal to one of these parts, and the cross-line opposite G O is the eighteenth part of a quadrant about the point marked O as centre; the arc of a circle cutting the first named cross-line at right angles at its upper point and passing through the upper point of the second cross-line limits the remaining cross-lines. The cross-lines increase in length successively, but not so rapidly as in the case of the stereographic projection. Hence the successive spaces vary in shape and area, but the area of the greatest is not quite $1\frac{3}{8}$ times as great as that of the least, instead of being four times as great, as in the stereographic projection. Neither the projection from E nor the modification adopted in mapping possess any geometrical properties worthy of special notice.

The sole remaining projection commonly used is the *orthographic*, in which the centre of projection is supposed to be in P Q, but at an infinite distance from P. A portion of this projection is represented at *f*, fig. 2, the base-line being equal to P O′, fig. 1, determined by drawing O A O′ parallel to Q P. It is clear that portions near the circumference of the projected

points near P, $x = 2r$; for the bisection of the arc P A, $x = r\,(1{\cdot}938)$, [instead of $r\,(1{\cdot}707)$, the distance of E from G in fig. 1]; and for points near A, $x = r\,(1{\cdot}752)$. The projection thus interpreted may be applied to the whole sphere; and we shall obtain for points near S, $x = r$,—that is, S is the centre of projection for points near S.

hemisphere are greatly contracted in the direction of lines drawn to them from the principal point, but not in the direction at right angles to such lines. The projection possesses many elegant and valuable properties, but as it is not commonly used either for celestial or terrestrial maps (not being well adapted for either purpose), an examination of its properties would here be out of place.*

At *e* (fig. 2) is represented a strip of a map constructed by a method which occurred to me while examining the question of projections. Professor Nichol, in his 'Cyclopædia of the Physical Sciences,' mentions the problem proposed by Babinet, and solved by Cauchy, of the *homolographic* (or, as I prefer to call it, the *equigraphic*) projection of maps; that is,

* In Nichol's 'Cyclopædia of the Physical Sciences,' it is stated that the orthographic is the projection commonly seen in the 'pair of hemispheres' of atlases. Sir J. Herschel also, in his 'Outlines of Astronomy,' speaks of this projection as 'chiefly employed in maps.' It may possibly have been used in some old atlases, but is never applied in modern mapping. Pictures of the moon, sun, and planets, as they appear in the telescope, are orthographic projections of the spherical surfaces of those luminaries. Maps of the moon on less distorted projections might easily be constructed as illustrations of works on popular astronomy.

Since the earth viewed from the sun would be seen orthographically projected, very exact illustrations of the changes of the seasons may be given by means of orthographic projections of the terrestrial sphere in its varying positions with respect to the sun. The same changes may also be very exactly exhibited by means of orthographic projections of the celestial sphere and its circles. Examples of such applications of the orthographic projection to the case of Saturn are given in Chapter VII. of my work on that planet, and illustrated by the figures of Saturn in plate XIII. and by figure 1 of plate XI. The accounts of the earth's seasons in all the works on popular astronomy I have seen are loose and imperfect; a more exact investigation might easily be presented in a form sufficiently simple to be suited to a work on popular science.

of the construction of maps in which all areas shall be correctly given. The problem (a very simple one) admits, however, of many solutions. So far as I am aware, the method I am about to present is original. I suppose the sphere to be divided into narrow belts by planes parallel to the tangent-plane at P, and that each belt is projected from such a point in PQ that the area of the ring into which the belt is projected shall be equal to the area of the belt. For this purpose the point of projection must be at h, such that S h = 2 G S, for points near P, and move up towards H, such that S H = S A, as the successive belts are taken farther and farther from P, until, for the belt next to A, the point of projection is at H.* A point midway

* The formula connecting y, the distance of the point of projection from P, with θ, the spherical radius of the belt (supposed so narrow that its breadth may be neglected), is $y = 2r\left(1 + \cos\frac{\theta}{2}\right)$. But there is a simple geometrical method of obtaining the projection (so-called) which is worthy of notice. If B h' P represent a quadrant of a hemisphere of which S is the centre, and S P the radius, then, if we project the sphere S A P from S (that is, quasi-stereographically) on this hemisphere, and project the resulting projection orthographically on the tangent-plane at P, we shall obtain an equigraphic projection of the complete sphere. For the hemisphere of which P A is a quadrant we obtain the radius P H$'$, by drawing S A h', and then h' H$'$ perpendicular to P S$'$; the radius for the complete sphere will clearly be P S$'$ (= S B). The mathematical reader will find no difficulty in proving that this geometrical method corresponds with the formula obtained above, or in establishing the correctness of either method. The following is a sketch of the proof that the geometrical method gives an equigraphic projection:—Let A be *any* point on the sphere P A S (that is, suppose for the moment that A is not a particular point, viz., the extremity, of the quadrant P A), A O the tangent at A; let S A h' represent a cone of minute vertical angle enclosing a minute element of the surface of the sphere S A P at A and of the sphere B h' P at h'; lastly, let h' H$'$ represent a cylindrical surface formed by perpendiculars from every point of the boundary of the element of area at h' to the tangent-

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between h and H would give as near an approach to the true equigraphic projection of the sphere as the point E gives to the true equidistant projection. It will be seen from fig. 2, *e*, that distances between the successive divisions diminish slowly in this projection,—the successive cross-lines of course increasing since the successive spaces are of equal area.

The complete hemisphere of which P is the pole can be projected upon the tangent-plane at P by any of the methods considered except the gnomonic. But the orthographic and equigraphic methods are clearly unfit for the purpose of star-maps, the first because the distortion and variation of scale is so great at the edges, and the second because the equality of areas is not so great an advantage in a star-map as to compensate for distortion and variation of linear scale. Of the two remaining projections the *equidistant* usually has the

plane at P, enclosing therefore an element of area at H′; it will be sufficient for our purpose to prove that the element of area at H′ is equal to the element of area at A. Now the tangent at h' is parallel to PA, and H′h' is parallel to SP; hence the inclination of the tangent-plane at h' to H′h' is equal to the angle SPA; also (Euc. III. 32) the angle SAO is equal to the angle SPA; hence (from the known relation connecting areas with their orthogonal and conical projections),

$$\begin{aligned} \text{the element at } H' : \text{the element at } h' &:: \sin APS &&: 1 \\ &:: SA &&: SP, \end{aligned}$$

and

$$\begin{aligned} \text{the element at } h' : \text{the element at } A &:: (Sh')^2 \sin SAO &&: (SA)^2 \\ &:: (SP)^2\, SA &&: (SA)^2\, SP \\ &:: SP &&: SA, \end{aligned}$$

therefore *ex æq.*

$$\text{the element at } H' : \text{the element at } A :: SA : SA;$$

that is, the element at H′ is equal to the element at A. It follows that by the double method of projection described every element of the surface of the sphere is projected into an element of equal area; hence the result is an equigraphic projection of the complete sphere.

preference for popular star-maps; and, I think, on the whole, rightly. The stereographic method, it is true, gives the relative positions of stars forming small groups very correctly, and the mathematician will always prefer a projection whose properties enable him to trace down correctly and easily any circle, small or great, which he may desire to draw upon his map, to a projection which, even if correctly marked in, presents no such advantages, and which is usually marked in so as not to be a true projection of the sphere. But the variation of scale and area renders the stereographic projection of a complete hemisphere very deceptive to the general student, and the distortion of large star-groups is very great in this projection, unless the stars forming such groups happen to fall nearly on a circle of the celestial sphere. The variation of scale in the equidistant projection is less, and the variation of area much less, than the corresponding variations in the stereographic projection. Hence the former projection is calculated to give the student a somewhat more correct notion of the distribution of the stars than he would obtain from a stereographic map.* Neither projection is satisfactory, however,

* With all deference to the authorities (as Sir J. Herschel, and Professors Hughes and Nichol) who have expressed a contrary opinion, I cannot but think that the same consideration may be extended to terrestrial maps. Stereographic maps of the two hemispheres give the *outlines of countries* much more correctly than equidistant or globular maps, but the *outlines of continents* less correctly, and the *relative areas of countries and continents* much less correctly. Now the correct delineation of countries should be sought in maps of countries, not in maps of hemispheres; but the other two points are objects which it is desirable to attain in popular maps of hemispheres. Therefore, as it seems to me, the equidistant projection is to be preferred, as giving a nearer approach to correctness in these particulars than the stereographic.

and in fact a pair of star-maps, each containing one hemisphere, is only fitted to serve as a guide or index to a more complete series, just as maps of the two hemispheres serve to exhibit the connection between the maps forming a terrestrial atlas.

In considering the mode of projection to be adopted for a set of maps for popular use, it will be found that the choice lies between the gnomonic and stereographic projections. There is much to be said in favour of each. The stereographic has the advantage over the gnomonic in the following respects,—the variation of scale increases as the difference of the tangents of half the arcs from the principal point, instead of as the difference of the tangents of the arcs themselves; small circles are represented either by lines or circles, instead of by conic sections; and there is no distortion in small groups. On the other hand, the gnomonic projection has the following advantages:—All great circles are represented by straight lines, a property whose utility has been already referred to; the gnomonic is the natural projection for star-maps, since we view the celestial sphere from its apparent centre; and it enables us to present the whole sphere in a series of maps uniform in size and shape, and bounded by straight lines, each edge of each map corresponding to some edge of some other map, an arrangement convenient, if not indispensable, for popular star-maps, and which can be obtained by no other mode of projection. On the whole, while a mathematician would probably consider the stereographic projection as absolutely the best of all possible projections for all maps, celestial or terrestrial (excepting, of course, maps intended to subserve some special purpose, as Mercator's charts or the like), I think that for popular star-maps the gnomonic projection is to be preferred, if only it can

be shown that the sphere can be divided into convenient compartments, not too great in number, and in which, nevertheless, the distortion and variation of scale shall not be excessive.

It is obviously desirable that a series of maps should be uniform in size and shape. If this is considered a condition to be insisted upon then we have only five methods to select from. For, if the sphere is gnomonically projected on tangent-planes uniform in size and shape, these together must form a regular solid circumscribing the sphere, and there are only five such solids. And whether the condition be insisted upon or not, it may be readily proved that (*cæteris paribus*) the regular figures will give us for a given number of maps the least possible distortion.* Now of the five regular solids we may at once dismiss the three whose faces are equilateral triangles,—viz., the tetrahedron, the octahedron, and the icosahedron,—the first because the distortion would be excessive, the maximum variation of scale being from 1 to 9, and the maximum variation of area from 1 to 27 ; the second because, although the figure has 8 faces, yet the distortion and scale-variation are the same as in the cube with its 6 square faces; the third because, though the figure has 20 faces, the distortion and scale-variation are the same as in the dodecahedron with its 12 pentagonal faces.† There remain then only the cube and the dodecahedron to be considered.

The six maps corresponding to the cube are shown in fig. 3, the first four figures of which diagram represent the four

* If for 'a given number of maps' be substituted 'a given number of *map-edges*,' the proposition would be true without the qualifying parenthesis.

† These properties depend on the circumstance that the cube and octahedron circumscribing a sphere have the same circumscribing sphere; and the dodecahedron and octahedron are connected in the same way.

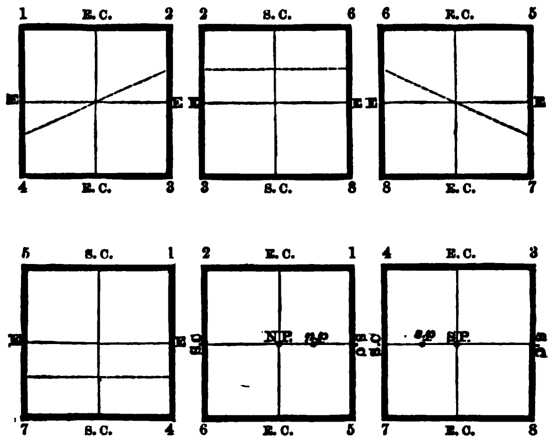


FIG. 3. ILLUSTRATING THE GNOMONIC PROJECTION OF THE SPHERE IN SIX SQUARE MAPS.

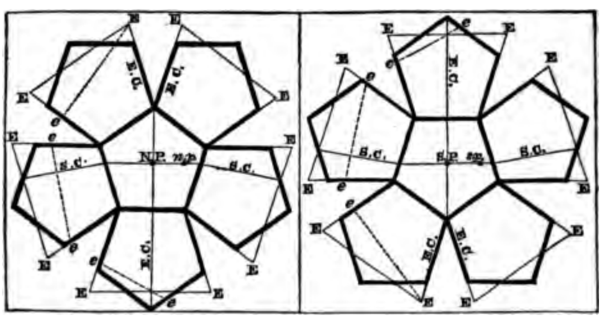


FIG. 4. ILLUSTRATING THE GNOMONIC PROJECTION OF THE SPHERE IN TWELVE PENTAGONAL MAPS.

equatorial maps, E E being the equator, while the last two represent the two polar maps. In all the six figures E. C. indicates the equinoctial and S. C. the solstitial colure. The ecliptic is represented by the dotted lines in the first four figures, and *n. p.*, *s. p.*, in the polar maps are the poles of the ecliptic. The middle of each edge of a map represents a point removed 45° from the centre of the map, but the angles are removed no less than 54° 44′ 8·2″ from the centre of the map. Now it is easily seen from fig. 2, *b*, that at points nearly 55° from the principal point the distortion, scale variation, and variation of area are very great.* This may be more clearly seen from fig. 5, in which A *a*

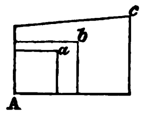


FIG. 5.

represents the true shape, A *c* the distorted shape, of a space supposed to lie 54° 44′ from the principal point. Maps constructed on the faces of a cube have other defects besides these, however. They must necessarily be presented in separate sheets, so that the connexion between them is not exhibited. It will be seen, by comparing the numbers at the corners, which are the same for the same angle of the cube, that constellations near the angles are separated in a very inconvenient manner. For instance, a constellation near the angle numbered 4 will have parts in the lower left-hand corner of Map I., in the lower right-hand corner of Map IV., and in the upper left-hand corner of Map VI.; in each map, further, it will be distorted in a different direction: thus it will not be easily recognised.

* The maximum scale-variation in the cubical maps is from 1 to 3, the maximum variation of area from 1 to $5\frac{1}{5}$ nearly.

The twelve maps corresponding to a dodecahedron are represented by the twelve dark outlines in fig. 4. They are here collected in a manner which has obvious advantages, viz., in two sets of six, formed by a central polar and five outer maps, each of the latter containing a tenth part of the equator. The colures are represented by the lines E.C. and S.C., and the ecliptic by the dotted line *e e e*. Each set of six maps represents nearly a complete hemisphere, and by extending two sides of each of the outer maps, to meet the equator-line produced, and thus adding ten small triangles to the outer maps of each set, each set may be made to include a complete hemisphere. Parts of the sphere near the equator are thus given in duplicate, an arrangement which aids the recognition of constellations divided by the equator. The angles of each pentagon are at a distance of 37° 22′ 38·5″ from the centre or principal point, and it is easily seen from *b*, fig. 2, that the distortion, scale-variation, and variation of area are not nearly so great as in the projection last considered.* In fig. 5, A *a* represents the true, A *b* the distorted shape of a space lying 37° 23′ from the principal point. Thus the dodecahedron appears to possess decisive advantages over the cube for the purpose of popular star-maps.

Of less regular arrangements two may be noticed, viz., the 14 faces of the solid formed by symmetrically combining the cube and octahedron circumscribing the same sphere, and the 32 faces of the solid formed by similarly combining the dodecahedron and the icosahedron.† The first arrangement has a

* The maximum scale-variation for the dodecahedral maps is from 1 to nearly $1\frac{3}{8}$; the maximum variation of area from 1 to 2 nearly.

† The possibility of these combinations depends of course on the circumstance that the cube has six faces and eight angles, the octahedron

slight advantage over the dodecahedral in respect of distortion, the angles lying nearly 2° nearer to the principal point; but this advantage is more than compensated by the irregularity of the developed figures, which consist (for each hemisphere) of an irregularly hexagonal polar map, bounded by three similar hexagons and by three squares. Further, whereas in the dodecahedron those edges of the outer maps which lie next to the polar map are parts of meridians, in the irregular figure the corresponding edges are crossed by the meridians at varying angles. Maps so constructed would be unfit for popular use, and the 32-faced solid clearly lies in the same category.

For maps not intended merely for popular use, the stereographic projection is on the whole preferable to the gnomonic. If such maps are not required to be uniform in shape or small in number, the conical projection, presently to be considered, may be used; but for a limited number of maps, uniform in size, the stereographic projection is preferable, as being uniform; whereas the properties of the conical projection vary with the central latitude of the map. The regular solids suggest different modes of dividing the sphere into stereographic maps, which, if there is to be no overlapping, will be bounded by circularly-curved outlines. A very complete celestial atlas might be formed by taking the centres of the 12 maps of the dodecahedral scheme just considered as the centres of 12 circular, and therefore overlapping, stereographic maps. The distortion would be very small,* and the connexion between the maps might be indicated by adding the dodecahedral gnomonic maps, on a smaller scale, as index-maps.†

eight faces and six angles, and the corresponding relation between the number of faces and angles in the dodecahedron and icosahedron.

* The variation of scale would be from 1 to little more than $1\frac{1}{8}$.

† I hope shortly to be able to construct such a set of maps to which

But however complete a series of celestial maps the astronomical student may possess, he will often find it desirable to form separate maps of small parts of the heavens. For this purpose no method combines simplicity of construction with correctness so satisfactorily as the conical projection. I proceed to discuss the construction of maps on this projection, or rather on that modification of it which is commonly adopted, and which is best calculated to subserve the purpose in view.

In the true conical projection, a cone having for axis the polar axis of the sphere is supposed to touch the sphere in a declination-parallel, and a part of the sphere near some given point in this parallel is supposed to be projected upon the surface of the cone from the centre of the sphere; the surface, being then supposed to be cut open along a generating-line (that is, along a line through the vertex), is spread out flat or developed. It is clear that the meridians in this projection are straight lines, all passing through one point, and that the declination-parallels are circles about the same point as com-

the two plates of my gnomonic maps would serve as index. The scale of the stereographic maps might be that of an 18-inch globe without requiring a larger sheet than the Royal quarto of my maps. [The scale of the maps in the present work is that of a 15-inch globe.] Thus all stars to the sixth magnitude inclusive could be conveniently and clearly introduced; constellation-figures could be omitted, as the index-maps would supply them fully as completely as their importance warrants. In fact, *per se*, the addition of these figures is a positive injury to a star-map, though a series of popular maps would be considered incomplete without them. The longitude-lines and parallels (except, of course, the ecliptic) could be also omitted, since a table of precessional variations would be a necessary adjunct to maps on so large a scale. The heliocentric orbits of the planets would add to the completeness of the series.

mon centre; the distances between successive circles increasing from the middle parallel, exactly as the distances increase between the successive cross-lines in *b*, fig. 2. Two modifications of this projection are, however, generally adopted:— the distance between successive parallels is made constant; and the cone, instead of being a tangent-cone, is supposed to be a secant-cone, intersecting the sphere in two parallels lying midway between the middle parallel and the pair of extreme parallels. The latter arrangement, which would only serve to diminish the scale of the maps in the true conical projection, determines the constant distance between the parallels in the modification we are considering. It is clear that distances measured along parallels near the middle parallel are slightly too small, while distances measured along parallels near the extreme parallels are slightly too great, but for maps not having a great length in declination the defect will be almost inappreciable. The distance of the centre of the circles is slightly diminished in the modified projection, but the angle between successive meridians is not altered.*

Another modification of the conical projection may be noted in passing. In this the parallels are represented by circles

* If r be the radius of the sphere, δ the declination of the middle parallel, and a the difference of the R.A.'s of two given meridians; then for the true conical projection the distance of the centre from the middle parallel is $r \cot \delta$, and the angle between the two given meridians is $a \sin \delta$; but for the modified projection the former quantity becomes $r \cot \delta \cos d$, where d is the distance of the parallels through which the secant-cone passes, from the middle parallel. As d is in general equal to about one-fourth of the map's range in declination, $\cos d$ is very nearly equal to 1 for maps of small size. Thus, in a map having a range of 30° in declination, $d = 7\frac{1}{2}°$, and $\therefore \cos d = \cdot 9925$, or we should only have to diminish the distance of the centre by one-133rd part.

drawn as in the former case; but to obtain the meridians, arcs of right ascension are measured from the central meridian, which is straight, along each parallel, according to the true law of variation of such arcs. A curved line is drawn through each set of points thus obtained for each meridian. This modification is admissible where a map has a great range in declination, and a very small range in right ascension. But in all ordinary cases, while it fails to correct (or, rather, increases) errors of distance, it introduces large errors of angles. It is clearly quite unnecessary for maps of small parts of the sphere of whatever figure.*

The construction of maps on the conical projection is a

* This modification of the conical projection is perhaps rather to be considered as a modification of the projection used by Flamsteed for his 'Celestial Atlas.' Flamsteed represented the parallels by straight lines parallel and equidistant, one meridian by a straight line perpendicular to the parallels, and the other meridians by curved lines obtained as in the method explained above. This projection, which is described in the 'Encyclopædia Britannica' as 'the simplest and most successful method of remedying the defects of the conical development,' appears to me one of the most defective projections ever devised, and altogether unworthy of its author's reputation as a mathematician. It combines every defect save one of all other projections; exhibiting distortion of figures large and small, scale-variation, and a want of that uniformity in the increase of these which compensates for the defects of many projections. These deficiencies are poorly compensated by the circumstance that the projection is equigraphic, a property not aimed at by Flamsteed, and which has little value for celestial maps. The modification of Flamsteed's projection described above is also equigraphic, but its defects are not compensated by this advantage, which may be obtained at less expense. Professor Hughes, the well-known geographer, correctly estimates the qualities of this projection, so commonly met with in our atlases,—'it has great and obvious defects, and is altogether wanting in the simplicity and truthfulness of the conical projection' ('Construction of Maps,' p. 115). See note *, p. 38.

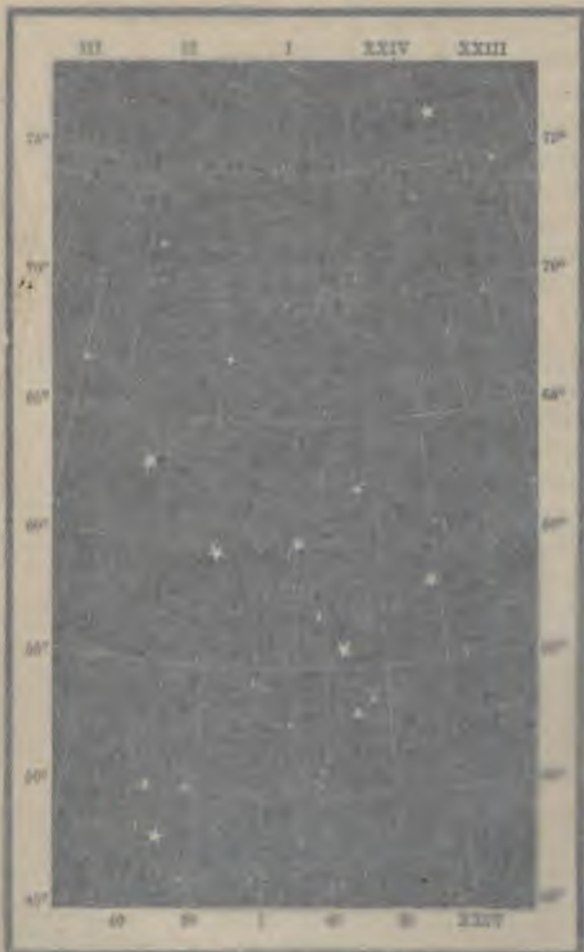
matter of great simplicity. Table IV. contains a list of values which are necessary or convenient for the purpose. The central figure represents a strip of a 6-inch globe contained between quadrants of two meridians 5° apart, and crossed by parts of declination-parallels 5° apart; the dotted outline represents (for the purpose of comparison) a corresponding strip between quadrants of two declination-parallels $2\frac{1}{2}°$ north and south of the equator, and crossed by parts of meridians 5° apart. On each side of this figure declinations are marked, while down the sides of the table north polar distances are marked corresponding to these declinations, supposed *north* for the left-hand column of polar distances and *south* for the other column. The second column to the left gives the lengths of arcs of 5° of right ascension for the different declination-parallels, the arc of five degrees on the equator being assumed equal to 1; the next column gives (to the same unit) the distance, from the different parallels, of the centre of convergence of tangents to the meridians, the distance being measured and the tangents drawn from the same parallel: corresponding columns to the right give the angle of inclination of such tangents—the meridians they touch being 5° apart, and the areas of spaces between successive parallels and bounded by meridians 5° apart.

To illustrate the use of this table, let us suppose we wish to construct a map of the constellation Cassiopeia. Turning to Table I., we find that the middle parallel of declination should be about midway between the 60th and the 65th, and the bounding parallels should be the 45th and 80th, so that we may take for the mean parallels the 55th and 70th. For the middle meridian that whose right ascension is 24h. 50m. should in like manner be taken. Draw then the indefinite

dotted line N b, Map II. for the central meridian, assume a length $b\,c$ for the arc of 5° of a great circle, and measure off as many spaces, $c\,d$, $d\,e$, $e\,f$, $f\,a$, each equal to $b\,c$, as are required; let c mark the 55th parallel, so that f marks the 70th. From Table IV. we find that the lengths of arcs of 5° on the 70th and 55th declination-parallels are respectively 0·342 and 0·574 (the unit of length being the arc of 5° of a great circle, and therefore represented by $b\,c$). Through c and f draw $g\,f\,h$ and $k\,c\,l$ at right angles to N b, and take $g\,f = f\,h = 0{\cdot}171$, and $k\,c = c\,l = 0{\cdot}287$. Join $g\,k$, $h\,l$, and produce either way as far as may be required. Then, if we draw through the points of division of N b lines at right angles to N b, as $q\,p$, $n\,m$, &c., we have the conical approximation to the true figure of the strip of a globe between parts of two meridians 5° apart and crossed by parallels 5° apart. The strip is a little too narrow near $n\,p$, and a little too wide outside a and b, but nowhere far from its just width, as may be seen by comparing it with the corresponding strip between the 45th and 80th parallels of fig. 6.

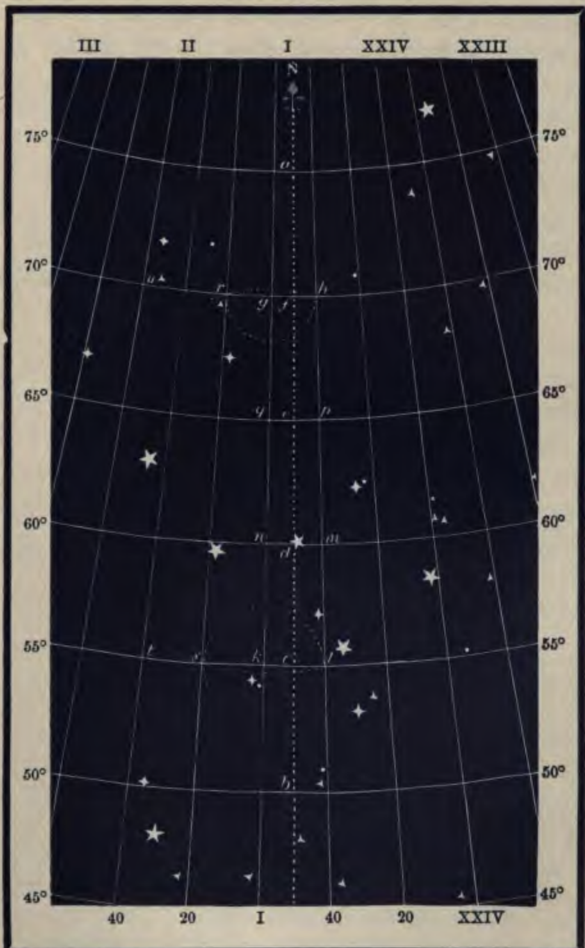
Now, if we supposed the figure we have just obtained to be turned over about the line $g\,k$, as axis, till it again meets the plane of the map, and then to be again turned over about its left edge, and so on as often as necessary, leaving in each case its tracing on the map, we should clearly obtain the meridians, and the continuations of the parallels to the left of N b; and in like manner those to the right of N b could be obtained. The geometrical construction indicated is very simple,—opening a pair of compasses to the distance $k\,h$ or $g\,l$ trace from centres k and g the small arcs $r\,h$, and $s\,l$; from the same centres with respective distances $k\,l$, and $g\,h$, trace the large arcs $s\,l$ and $r\,h$; join the points r and s thus determined. We

MAP II.



CASSIOPEIA.

MAP II.



CASSIOPEIA.

thus have the next meridian to the left of *gk*; and proceeding in the same manner from the centres *r* and *s*, we obtain the next meridian and so on; and in like manner of the meridians to the right of N*b*. Then opening a pair of compasses to the length *b c*, we have only to measure off from *r*, or *s*, and from corresponding points in the other meridians, as many spaces equal to *bc* as may be required either way, and to join the points thus obtained along each parallel, to complete the set of parallels indicated in the map. The meridians and parallels must then be properly numbered, and the stars marked in according to the places given in Table I.*

The preceding construction may often be simplified. Suppose, for instance, that the part of the sphere we wish to map lies so near a pole that the distance of the centre of the circles representing the parallels is small, then we can make use of those columns of Table IV. in which the angle between successive meridians,† and the distance of the point of convergence, are given. The last we may slightly diminish as described in the note on p. 33, but in general there is no necessity for such alteration. The parallels can then be described as parts of

* The student will find it convenient to mark the stars in with vermilion, the rest of the map in faint Indian ink. In this way the configuration of a constellation may be very clearly exhibited. The effect of such maps as are given in the present work is in like manner improved by taking a tint of Indian ink over meridians, parallels, &c., so as to increase the relative brilliancy of the stars.

† As it is not easy to obtain small angles correctly from a protractor, it is better to draw, from the point which is to be the centre of the parallels, two lines to represent meridians tolerably wide apart, multiplying the angle given in Table IV. by 5, 6, 7 . . . according as these meridians are 5, 6, 7 . . . . times 5° from each other, and dividing the arc of any parallel into 5, 6, 7 . . . . equal arcs; then lines from the centre to the points of division are the meridians required.

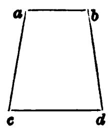
concentric circles. Again, if the part of the sphere to be mapped lies near the equator, we may measure off the distances corresponding to kl and gh in lines at right angles to the central meridian, without appreciable error. An instance of this is given in Map III., in which it will be seen that these distances are not appreciably unequal. Having obtained the meridians, we can readily obtain the parallels. For instance in Map II., opening a pair of dividers to the distance kh or gl, place the point of one leg at k, then place the point of the other leg on the next meridian at r, the first point on the next meridian at t, thence to u, and so on; and the like to the right of N b. Then, from the points thus determined on each meridian, measure off as before as many distances equal to bc as may be required.

For parts of the sphere divided by the
into cylindrical
parallels becom
mapped out is
part is larger.*

* It is singular
application of the
most accurate (sin
tangent-cone), Fla
any other case, s ... conical projection is
commonly adopted ...stance of cylindrical projection. (Of course Mercator's projection is an instance of cylindrical projection, but on a principle altogether distinct from that we are considering, in which the parallels would be equidistant.) We have here a case in which we can conveniently compare the defects and advantages of the conical, Flamsteed's, and the stereographic projection. Take in an equatorial map (as for instance in that part of a map of Africa which is most distorted in all three projections), four points a, b, c, and d, a and b in latitude 40° north, c and d in latitude 35° north, a and c being in

tained by drawing through a centre lines inclined at an angle of 5° for the meridians, and equidistant concentric circles for the parallels.

longitude 40°, b and d in longitude 35° east or west of the central meridians; so that the four points form a quadrilateral arranged



Then representing ac or bd, that is, an arc of 5° on a great circle, by 1, the following table represents the true and projected distances and bearings of the four points from each other:—

	ab	cd	ac	bd	ad	bc	acd	$\angle cb$	cb	$\angle da$	$\angle bcd$	$\angle cda$
							° ′	° ′	° ′	° ′	° ′	° ′
True . . .	0·766	0·819	1·000	1·000	1·302	1·302	90 0	90 0	90 0	90 0	51 35	51 35
Cylindrical .	0·883	0·883	1·000	1·000	1·334	1·334	90 0	90 0	90 0	90 C	48 33	48 33
Flamsteed's .	0·766	0·819	1·089	1·067	1·075	1·555	67 1	69 39	67 1	69 39	40 2	68 27
Stereographic	0·953	0·993	1·245	1·212	1·566	1·567	90 0	90 0	90 0	90 0	51 35	51 35

Comparing these, we see that Flamsteed's projection has the advantage in the two first columns, the cylindicral in the next four—Flamsteed's being particularly faulty in the 5th and 6th columns; in the first four columns of angles the conical and stereographic projections have a great and equal advantage over Flamsteed's, and finally in the last two columns the stereographic has the advantage over both the others—Flamsteed's being here again very faulty. But even in the first six columns, in every one of which the stereographic projection seems surpassed by the others, it has in reality the advantage—for whereas in the cylindrical projection two dimensions are much greater than, two equal to, and two slightly greater than, the true values; and in Flamsteed's two are equal to, two slightly greater than, one much less than, and one much greater than, the true values; in the stereographic projection all the six dimensions are greater than the true values, and

A carefully drawn figure, such as fig. 6, only on a larger scale, on talc, pierced with fine pin-holes at the points in which the parallels meet the meridians, would be a very useful addition to a set of mathematical instruments. Provided with such an instrument, the student could construct maps on the conical projection much more easily than by the methods above described. For instance, in the case considered, he would mark his paper through the talc at the points *g*, *h*, *k*, and *l* (Map II.); then, shifting the talc till the marks at *g* and *k* were seen through the right-hand pair of corresponding pin-holes, he would mark the points *r* and *s*, and so on. In like manner he would mark in points along the meridians to the right of *h l*. He would then draw the meridians and obtain the remaining points of the parallels by measuring off as many distances equal to *b c* as might be required on each meridian. By the use of such an instrument, further, he would obtain maps to a constant scale, a very useful quality in a series of star-maps.

Table VI. shows the points at which the ecliptic crosses the different meridians. By means of this table the student can mark in the ecliptic in any map crossed by this circle. In

in a proportion increasing uniformly with the distance of the different lines from the centre of the map. Hence in the two former projections the scale of distances usually appended to maps is valueless, whereas in a stereographic map a scale which is true for a moderate distance from a point in the map in any direction, is true in all directions, and is true also for all points at the same distance from the centre of the map. Owing to the slowness of the variation of scale, three or four scales for different distances from the centre would suffice for accurate measurements all over the map.

[The distance of the point *a* from the centre of the map is 54° 44′, so that the assumed range of the map is large, and fairly tests the qualities of the stereographic projection.]

PATH OF JUPITER ACROSS PARTS OF SAGITTARIUS AND CAPRICORNUS, 186[illegible].

CHAPTER IV.

THE CONSTELLATION-SEASONS.

Table VI.

TABLE VI. indicates the appearance of the heavens at successive hours for every day of the year for the British Isles.* The visible celestial hemisphere is supposed to be distributed as follows:—The horizon is divided into sixteen parts towards the alternate points of the compass,—N., N.N.E., N.E., E.N.E., and so on; $22\frac{1}{2}°$ above the horizon, that is, one-fourth towards the zenith, a circle parallel to the horizon is supposed to be divided towards the same sixteen points; 45° above the horizon, or half-way towards the zenith, a circle parallel to the horizon is supposed to be divided towards every fourth point of the compass,—N., N.E., E., &c., or into eight parts; $67\frac{1}{2}°$ above the horizon, that is, $22\frac{1}{2}°$ from the zenith, a circle is supposed to be divided towards the cardinal points; and, lastly, the zenith point itself is added. Thus 45 points, the position of which it is perfectly easy to determine approximately, are supposed to be marked upon the heavens. For, assuming the same

* The hours in this table are astronomical, that is, they are counted from 1 to 24, the astronomical day commencing at noon. The hours of the night (that is, from the first hour following sunset to the last preceding sunrise) are marked in darker figures than the rest.

stand-point to be always used in making these observations, the bearings of the four cardinal points (always easily determinable by simple observations) and of the intermediate points, can be associated with the positions of familiar objects round the horizon,—such and such a house, or hill, or tree, or the like, being noted as lying at or near such and such a point of the compass. And even by night, when such objects may be invisible, their position will generally be known with sufficient accuracy. All then that remains is to conceive the division of the quadrants from the zenith to the horizon into four equal parts. In this, after a little practice, the student will find no difficulty, though at first he will be apt to take the divisions near the horizon too small. The height of the pole-star, which (in England) is about 7° above the middle point of the northern quadrant, will serve as a guide in this respect.

The table indicates the constellations in which these points severally fall, and when a particular star falls within two or three degrees of any of our division-points the letter of such star is appended. Although every fifteenth or sixteenth day only is noted yet the table serves for every day of the year. For the apparent diurnal and annual motions of the stars take place in the same direction, namely from east to west about the pole, the stars moving as far forward in about fifteen days by the annual motion as in one hour by the diurnal motion. Thus if we know that on May 3rd, at 10 p.m., the stars will be in a certain position, then we know that on May 4th they will occupy the same position at about four minutes before ten, on May 5th at about eight minutes before ten, and so on; and, again, we know that on May 2nd they will occupy the same position at four minutes past ten, on May 1st at eight minutes past ten, and so on. To illustrate this, and the

general application of the table, let us suppose that we wish to determine the arrangement of the constellations for some hour between 9 p.m. and 10 p.m., on April 21st:—The table gives us arrangements for exact hours on April 17th, and therefore for periods preceding those hours by 16 minutes on April 21st. Hence at 9h. 44m. p.m. on April 21st the arrangement of the constellations over the visible hemisphere is the following, —the star γ of the Greater Bear lies near the zenith; the points $22\frac{1}{2}°$ from the zenith towards the north, east, south, and west, are occupied by Draco, Canes Venatici, Leo Minor, and the Lynx, respectively; the points 45° from the horizon, towards N., N.E., E., S.E., &c., are occupied by Cepheus, Draco, Corona Borealis (near the star θ), Bootes, &c., respectively; and so on for points $22\frac{1}{2}°$ from the horizon, and for the horizon itself.

Using the table in the manner above indicated, several times during the year, and aided by well-constructed star-charts, the student will find that it is a much easier matter than he might suppose, to become acquainted not only with the constellations but with small groups and separate stars. Three or four stars appearing through a break in clouds covering all the rest of the sky, are sufficient to indicate to the practised observer the position of the constellation they belong to, and of neighbouring constellations, the hour of the night (roughly), and the direction of the points of the compass.

TABLES.

GREEK ALPHABET.

		Name.	*Sound.*			*Name.*	*Sound.*
Α	α	Alpha	a	Ν	ν	Nu	n
Β	β	Beta	b	Ξ	ξ	Xi	x
Γ	γ	Gamma	g	Ο	ο	Omicron	o *short*
Δ	δ	Delta	d	Π	π	Pi	p
Ε	ε	Epsilon	e *short*	Ρ	ρ	Rho	r
Ζ	ζ	Zeta	z	Σ	σ ς	Sigma	s
Η	η	Eta	e *long*	Τ	τ	Tau	t
Θ	θ	Theta	th	Υ	υ	Upsilon	u
Ι	ι	Iota	i	Φ	φ	Phi	ph
Κ	κ	Kappa	k	Χ	χ	Chi	ch
Λ	λ	Lambda	l	Ψ	ψ	Psi	ps
Μ	μ	Mu	m	Ω	ω	Omega	o *long*

TABLE I.

CATALOGUE OF 1,500 STARS.

ANDROMEDA.

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
	ANDROMEDA.	*Andromeda.*				h. m.	° ′
1	8023	1	ο	4		22 56·4	41 41 N.
2	8082	7		5		23 7·1	48 45 N.
3	8114	8		5		23 12·2	48 22 N.
4	8224	16	λ	4½		23 31·7	45 49 N.
5	8229	17	ι	4		23 32·3	42 36 N.
6	8237	19	κ	4½		23 34·5	43 40 N.
7	8261	20	ψ	5		23 40·1	45 45 N.
8	4	21	α	1	Dup.	0 2·2	28 26 N.
9	16	22		5		0 4·1	45 24 N.
10	52	24	θ	5		0 10·8	38 1 N.
11	155	29	π	4½	Dup.	0 30·5	33 4 N.
12	164	30	ε	4		0 32·2	28 40 N.
13	166	31	δ	3		0 32·9	30 12 N.
14	215	34	ζ	4		0 41·0	23 37 N.
15	227	35	ν	4		0 43·2	40 26 N.
16	259	37	μ	4	Dup.	0 50·1	37 51 N.
17	264	38	η	5		0 50·8	22 47 N.
18	318	41		5		1 1·1	43 18 N.
19	330	42	φ	5		1 2·5	46 36 N.
20	334	43	β	2	Dup.	1 3·0	34 59 N.
21	404	46	ξ	4½		1 15·3	44 54 N.
22	432	48	ω	5		1 20·5	44 47 N.
23	441	49	A	5		1 22·9	46 23 N.
24	480	50		5		1 29·7	40 48 N.
25	487	51		3½		1 30·6	48 1 N.
26	502	53	τ	5		1 33·6	39 58 N.
27	522	54		4		1 36·1	50 5 N.
28	628	57	γ	3	Trip.(v.)i	1 56·6	41 45 N.

ANTLIA.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	ANTLIA. *The Air-Pump.*					h. m.	° ′
29	3578		α	4½		10 21·7	30 27 S.
	APUS. *The Bird of Paradise.*						
30	4660		θ	5		13 53·7	76 13 S.
31	4692		η	5		14 3·3	80 26 S.
32	4712		ε	5		14 8·1	79 33 S.
33	4833		α	4½		14 33·0	78 32 S.
34	5439		γ	5		16 15·0	78 38 S.
35	5510		β	5		16 26·0	77 16 S.
36	5810		ζ	4		17 9·5	67 39 S.
	AQUARIUS. *The Water-Bearer.*						
37	7196	2	ε	4½		20 41·2	9 56 S.
38	7201	3		4		20 41·4	5 28 S.
39	7239	6	μ	4½		20 46·2	9 26 S.
40	7344	13	ν	5		21 3·1	11 52 S.
41	7478	22	β	3	Dup.(viii.)u	21 25·3	6 6 S.
42	7514	23	ξ	5		21 31·4	8 23 S.
43	7672	31	ο	5		21 57·1	2 44 S.
44	7688	34	α	3		21 59·6	0 54 S.
45	7691	33	ι	4½		22 0·0	14 27 S.
46	7773	43	θ	4½		22 10·5	8 23 S.
47	7790	47		5		22 15·0	22 12 S.
48	7795	48	γ	3		22 15·5	1 59 S.
49	7814	52	π	5		22 19·2	0 46 N.
50	7832	55	ζ	4	Dup.	22 22·7	0 38 S.
51	7840	57	σ	5		22 24·3	11 18 S.
52	7864	59	υ	5		22 28·1	21 19 S.
53	7868	62	η	4		22 29·2	0 44 S.
54	7970	73	λ	4		22 46·4	8 13 S.
55	7980	76	δ	3		22 48·3	16 28 S.
56	8062	88	c^2	4½		23 3·1	21 49 S.
57	8069	89	c^3	5		23 3·5	23 6 S.
58	8085	90	φ	5		23 8·1	6 42 S.
59	8109	93	ψ^2	5		23 11·7	9 50 S.
60	8116	95	ψ^3	5		23 12·7	10 16 S.
61	8144	98	b^1	5		23 16·7	20 45 S.
62	8161	99	b^2	5		23 19·8	21 18 S.

AQUARIUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
63	8202	101	b^4	5		23 27·0	21 35 S.
64	8232	102	ω^1	5		23 33·6	14 53 S.
65	8240	103	A^1	5		23 35·4	18 41 S.
66	8242	104	A^2	5		23 35·5	18 29 S.
67	8255	106	i^1	5		23 38·0	18 57 S.
	AQUILA. *The Eagle.*						
68	6361	2		5		18 35·7	9 10 S.
69	6487	13	ϵ	3½		18 54·2	14 54 N.
70	6526	16	λ	3		18 59·9	5 4 S.
71	6528	17	ζ	3		18 59·9	13 41 N.
72	6564	20		5		19 6·2	8 8 S.
73	6595	25	ω	5		19 12·2	11 23 N.
74	6644	31	b	5		19 19·3	11 41 N.
75	6646	30	δ	3½		19 19·5	2 53 N.
76	6701	38	μ	4½		19 28·2	7 8 N.
77	6703	37	k			19 28·5	10 49 S.
78	6713	39	κ	4		19 30·5	7 18 S.
79	6715	41	ι	5		19 30·5	1 33 S.
80	6729	44	σ	5		19 33·3	5 8 N.
81	6772	50	γ	3	Dup.	19 40·6	10 19 N.
82	6802	53	α	1½	Dup.	19 43·9	8 33 N.
83	6811	55	η	4	Var.	19 46·4	0 42 N.
84	6825	59	ξ	5		19 48·5	8 9 N.
85	6833	60	β	3½	Dup.	19 49·4	6 6 N.
86	6934	65	θ	3½		20 5·1	1 11 S.
87	6952	67	ρ	5		20 8·7	14 50 N.
88	7058	69		5		20 23·4	3 17 S.
89	7122	71		5		20 32·1	1 32 S.
	ARA. *The Altar.*						
90	5554			4		16 32·3	60 41 S.
91	5609		η	4½		16 39·4	58 49 S.
92	5683		ζ	3½		16 48·7	55 48 S.
93	5697		ϵ^1	4		16 50·0	52 59 S.
94	5713		ϵ^2	5		16 53·6	53 3 S.
95	5850		γ	3		17 15·3	56 16 S.
96	5852		β	3		17 15·3	55 25 S.
97	5859		κ^1	5		17 16·6	50 31 S.
98	5877		δ	4		17 20·3	60 35 S.
99	5899		α	3		17 22·6	49 47 S.
100	6105		θ	4		17 57·3	50 6 S.

ARGO.

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
	ARGO. *The Ship Argo.*					h. m.	° ′
101	2096		α	1		6 21·3	52 38 S.
102	2188		ν	3	Dup. (iv.)	6 34·1	43 4 S.
103	2256		τ	4		6 47·0	50 28 S.
104	2414		π	3		7 12·9	36 53 S.
105	2482		σ	4		7 25·4	43 4 S.
106	2602		ξ	3½		7 44·3	24 33 S.
107	2665		χ	4		7 53·7	52 39 S.
108	2710		ζ	4½		7 59·4	39 40 S.
109	2728		ρ	3½		8 2·4	23 58 S.
110	2755		γ	2		8 5·8	46 59 S.
111	2832		ε	2		8 20·1	59 7 S.
112	2950		ο	4		8 36·9	52 29 S.
113	2979		δ	3		8 41·4	54 16 S.
114	3126		λ	3		9 3·6	42 57 S.
115	3177		β	1		9 11·9	69 14 S.
116	3186		ι	2		9 13·9	58 46 S.
117	3213		κ	3		9 18·4	54 30 S.
118	3257		ψ	4		9 26·0	39 57 S.
119	3365		υ	3		9 44·1	64 31 S.
120	3410		φ	4		9 52·7	54 0 S.
121	3516		ω	4		10 10·9	69 26 S.
122	3686		θ	3		10 38·7	63 46 S.
123	3695		η	2	Var. Neb.	10 40·4	59 3 S.
124	3702		μ	3		10 41·6	48 47 S.
	(i) CARINA. *The Keel.*						
125	2176			5		6 32·3	52 52 S.
126	2259		B	5		6 47·2	53 29 S.
127	2962		*d*	5		8 38·0	59 19 S.
128	2998		*f*	5		8 43·6	56 19 S.
129	3073		b^1	4		8 54·0	58 46 S.
130	3089		b^2	4		8 56·5	58 37 S.
131	3136		G	5		9 4·8	72 8 S.
132	3149		*a*	5		9 7·8	58 29 S.
133	3152		*i*	5		9 8·6	61 50 S.
134	3249		*n*	5		9 24·2	64 24 S.
135	3289		*h*	5		9 29·0	58 42 S.
136	3320		*m*	5		9 36·0	60 47 S.
137	3353		*l*	5		9 41·9	61 57 S.
138	3526		*q*	5		10 13·1	60 44 S.

ARGO—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
139	3585		I	4½		10 22·0	73 25 S.
140	3586			5		10 22·6	65 2 S.
141	3594		*s*	5		10 23·5	58 8 S.
142	3619		*p*	4		10 27·8	61 4 S.
143	3655		t^2	5		10 34·2	58 34 S.
144	3740		*u*	5		10 48·6	58 13 S.
		(ii) Malus.	*The Mast.*				
145	2935		*b*	5		8 35·4	34 53 S.
146	2964		*a*	4½		8 38·8	32 45 S.
147	3195		*h*	5		9 16·2	25 27 S.
		(iii) Puppis.	*The Poop.*				
148	1933			5		5 55·5	42 49 S.
149	2137		Z	5		6 26·8	50 9 S.
150	2193		V	5		6 35·5	48 6 S.
151	2231		*x*	5		6 43·3	37 48 S.
152	2295		*t*	5		6 54·0	33 57 S.
153	2327		C	5		7 0·3	42 10 S.
154	2355		A	5		7 4·8	39 28 S.
155	2380		E	5		7 8·3	40 18 S.
156	2389		I	5		7 9·1	46 34 S.
157	2392		L^1	5		7 9·7	44 59 S.
158	2427		F	5		7 14·5	38 59 S.
159	2478			5		7 24·5	31 13 S.
160	2484			5		7 26·0	30 43 S.
161	2497		n^1	4½		7 29·3	23 13 S.
162	2500		*g*	5		7 29·5	25 51 S.
163	2530		k^1	4½		7 33·9	26 32 S.
164	2531		k^2	5		7 33·9	26 32 S.
165	2562	3		5		7 39·0	28 40 S.
166	2570		W	4½		7 39·6	40 38 S.
167	2580		*c*	5		7 41·0	37 41 S.
168	2594		*o*	5		7 43·1	25 38 S.
169	2620		P	4¼		7 45·6	46 4 S.
170	2622	9		5		7 46·2	13 35 S.
171	2629			5		7 47·8	34 24 S.
172	2634		*a*	5		7 48·1	40 16 S.
173	2635		*b*	5		7 48·4	38 33 S.
174	2644		R	4		7 49·8	47 47 S.
175	2666			5		7 54·5	18 4 S.

ARGO—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
176	2736	16		5		8 3·7	18 54 S.
177	2769	20		5		8 7·8	15 26 S.
178	2774		*r*	5		8 8·0	35 42 S.
179	2795		*q*	5		8 14·1	36 16 S.
180	2802		*w*	5		8 16·7	32 40 S.
			(iv) Vela. *The Sails.*				
181	2642			5		7 49·7	49 18 S.
182	2670			5		7 54·8	48 55 S.
183	2754			5		8 5·8	46 59 S.
184	2823		B	5		8 18·8	48 6 S.
185	2926		*e*	5		8 33·4	42 34 S.
186	2947		*b*	5		8 36·7	46 13 S.
187	2981		*a*	5		8 42·0	45 36 S.
188	3110		*c*	5		9 0·0	46 37 S.
189	3163		*l*	5		9 10·9	38 4 S.
190	3187		*k*	5		9 14·1	50 33 S.
191	3269		N	5		9 27·6	56 30 S.
192	3300		M	5		9 32·6	48 49 S.
193	3509		*q*	4		10 9·7	41 32 S.
194	3536		V	5		10 15·1	54 25 S.
195	3546		T	5		10 16·4	55 26 S.
196	3552		*r*	5		10 17·2	41 3 S.
197	3589		P	5		10 23·0	57 1 S.
198	3644		*p*	5		10 32·2	47 36 S.
			ARIES. *The Ram.*				
199	572	5	γ^1	$4\frac{1}{2}$	Dup.(v.)	1 46·9	18 42 N.
200	573	5	γ^2	$4\frac{1}{2}$		1 46·9	18 42 N.
201	577	6	β	3		1 48·0	20 13 N.
202	648	13	α	2	Dup.(viii.)u	2 0·4	22 55 N.
203	831	35		4		2 36·4	27 12 N.
204	845			4		2 38·5	9 36 N.
205	861	39		4		2 40·8	28 45 N.
206	870	42	π	5	Trip.(viii.)	2 42·6	16 58 N.
207	872	41		3	Dup.(vi.)u	2 42·9	26 46 N.
208	921	48	ϵ	5	Dup.(i.)	2 52·4	20 52 N.
209	986	57	δ	4		3 4·8	19 16 N.
210	999	58	ζ	5		3 8·0	20 36 N.
211	1034	61	τ^1	5		3 14·3	20 43 N.

AURIGA.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	AURIGA. *The Waggoner.*					h. m.	° ′
212	1520	3	ι	4		4 49·2	32 58 N.
213	1530	4		5		4 51·1	37 42 N.
214	1540	7	ε	4	Var.	4 53·4	43 39 N.
215	1541	8	ζ	4		4 54·1	40 54 N.
216	1554	9		5		4 57·3	51 26 N.
217	1558	10	η	4		4 58·1	41 4 N.
218	1602	11	μ	5		5 5·2	38 21 N.
219	1614	14[2]		5		5 7·6	32 33 N.
220	1613	13	α	1	Trip.	5 7·8	45 52 N.
221	1631	15	λ	5		5 10·7	39 59 N.
222	1690	24	φ	5		5 19·7	34 22 N.
223	1723	25	χ	5		5 24·6	32 6 N.
224	1768	26		5		5 31·6	30 25 N.
225	1830	29	τ	5		5 40·9	39 8 N.
226	1845	32	ν	5	Dup.	5 43·2	39 8 N.
227	1854	30	ξ	5		5 44·8	55 41 N.
228	1885	33	δ	3½		5 49·6	54 17 N.
229	1895	34	β	2		5 50·7	44 57 N.
230	1897	35	π	5		5 51·0	45 56 N.
231	1900	37	θ	4	Dup.	5 51·5	37 12 N.
232	2001	44	κ	4		6 7·7	29 32 N.
233	2044	46		5		6 15·7	49 21 N.
234	2159	50		5		6 30·8	42 36 N.
235	2182	55		5		6 34·4	44 39 N.
236	2223	58		5		6 42·3	41 56 N.
237	2338	63		5		7 3·4	39 31 N.
238	2381	64		5		7 9·7	41 6 N.
239	2416	65		5		7 14·0	36 59 N.
240	2429	66		5		7 15·8	40 54 N.
	BOOTES. *The Herdsman.*						
241	4597	4	τ	5		13 41·6	18 3 N.
242	4615	5	υ	4		13 43·7	16 24 N.
243	4648	8	η	3		13 49·0	19 0 N.
244	4656	9		5		13 51·1	28 5 N.
245	4726	17	κ	5	Dup. (vi.)	14 9·2	52 21 N.
246	4729	16	α	1	Dup. u.	14 10·2	19 49 N.
247	4741	19	λ	4		14 11·8	46 38 N.
248	4742	21	ι	4	Dup.	14 11·9	51 55 N.

BOOTES—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
249	4789	23	θ	4		14 21·1	52 24 N.
250	4808	25	ρ	4		14 26·7	30 54 N.
251	4812	27	γ	3½		14 27·2	38 50 N.
252	4823	28	σ	5		14 29·5	30 16 N.
253	4847	29	π	3½	Dup. (iv.)	14 35·1	16 56 N.
254	4849	30	ζ	3½	Dup. (ii.)	14 35·4	14 15 N.
255	4850	31		5		14 35·8	8 41 N.
256	4864	34		4½		14 38·2	27 3 N.
257	4873	35	ο	4½		14 39·7	17 29 N.
258	4876	36	ε	3	Dup. (iii.)	14 39·8	27 35 N.
259	4905	37	ξ	3½	Dup. (iv.)	14 45·9	19 36 N.
260	4958	42	β	3		14 57·4	40 52 N.
261	4969	43	ψ	5		14 59·3	27 25 N.
262	4974	44	i^2	5	Dup. (viii.)	14 59·8	48 7 N.
263	4981	45	c	5		15 2·0	25 20 N.
264	5031	48	χ	5		15 9·5	29 36 N.
265	5036	49	δ	3½	Dup.	15 10·7	33 46 N.
266	5084	51	μ	4	Trip.	15 20·0	37 48 N.

CÆLUM. *The Sculptor's Tools.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
267	1413		δ	5		4 27·2	45 13 S.
268	1458		α	4½		4 36·7	42 6 S.
269	1464		β	5		4 37·8	37 23 S.
270	1573		γ^1	5		5 0·1	35 39 S.

CAMELEOPARDALIS. *The Giraffe.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
271	1058			4		3 19·4	59 31 N.
272	1062			4		3 20·3	58 28 N.
273	1065			5		3 20·9	55 2 N.
274	1133			5		3 35·6	62 58 N.
275	1137		γ	4½		3 37·7	70 58 N.
276	1144			5		3 38·5	65 9 N.
277	1203			5		3 46·8	62 43 N.
278	1456	4		5		4 38·0	56 33 N.
279	1474	9	α	4		4 42·1	66 8 N.
280	1504	7		5	Dup.(viii.)u	4 47·7	53 34 N.
281	1536	10	β	4½		4 52·8	60 16 N.
282	1546	11		5		4 55·7	58 48 N.
283	1565			5		5 2·8	79 5 N.
284	1706			5		5 23·8	74 57 N.

CAMELEOPARDALIS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
285	1849	31		5		5 44·2	59 53 N.
286	1943	37		5		5 59·4	58 57 N.
287	1979	40		5		6 4·9	60 2 N.
288	1980			5		6 5·6	69 22 N.
289	2095			5½		6 25·8	79 42 N.
290	2198	42		5		6 38·4	67 42 N.
291	2209	43		5		6 40·8	69 2 N.
292	2210			5		6 42·6	77 8 N.
293	2326			4½		7 5·7	82 39 N.
294	2439			5		7 18·4	68 43 N.
295	2590			5½		7 45·8	79 48 N.
296	2707	55		5		8 0·9	68 50 N.
			CANCER.	*The Crab.*			
297	2714	10	μ^2	5		8 0·7	21 56 N.
298	2730	14	ψ^2	4		8 3·2	25 52 N.
299	2778	17	β	4		8 10·0	9 33 N.
300	2937	43	γ	4½		8 36·3	21 55 N.
301	2953	47	δ	4½	Dup.	8 37·9	18 36 N.
302	2965	48	ι	5	Dup. (viii.)	8 39·4	29 13 N.
303	3055	65	α	5		8 51·9	12 19 N.
304	3111	76	κ	5	Dup. (?)*	9 1·3	11 9 N.
		CANES VENATICI.			*The Hunting Dogs.*		
305	4126	2		5	Dup. (iv.)	12 10·1	41 20 N.
306	4128			5		12 10·5	33 44 N.
307	4235	8	β	4		12 28·0	42 1 N.
308	4346	12	α	2½	Dup. (vii.)	12 50·4	38 58 N.
309	4384	14		5		13 0·1	36 26 N.
310	4433			5		13 8·3	40 47 N.
311	4451	20		5		13 12·2	41 12 N.
312	4456	21		5		13 13·1	50 19 N.
313	4538	24		5		13 29·6	49 38 N.
314	4552	25		5		13 32·1	36 54 N.

* When occulted by the moon, κ Cancri has been observed to exhibit a sudden diminution of brilliancy before disappearing; it is therefore supposed to be a close double star.

CANIS MAJOR.

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	CANIS MAJOR. *The Greater Dog.*					h. m.	° ′
315	2051	1	ζ	2½		6 15·7	30 1 S.
316	2061	2	β	2½		6 17·4	17 54 S.
317	2066	3		4		6 17·7	33 22 S.
318	2109			4½		6 23·7	32 30 S.
319	2132	4	ξ^1	5		6 26·9	23 19 S.
320	2158			5		6 29·6	36 8 S.
321	2160	5	ξ^2	5		6 30·0	22 51 S.
322	2171	7	ν^2	5		6 31·5	19 8 S.
323	2213	9	α	1		6 39·9	16 33 S.
324	2246	13	κ	4		6 45·4	32 22 S.
325	2252			5		6 46·5	34 14 S.
326	2264	14	θ	5		6 48·1	11 53 S.
327	2267	16	o^1	4		6 49·2	24 2 S.
328	2274	20	ι	4½		6 50·8	16 54 S.
329	2293	21	ε	2½		6 53·9	28 48 S.
330	2309	22		3½		6 57·0	27 46 S.
331	2318	24	o^2	4		6 57·0	23 39 S.
332	2319	23	γ	4		6 58·3	15 27 S.
333	2345	25	δ	3½		7 3·5	26 12 S.
334	2388	27		4½		7 9·4	26 9 S.
335	2418	30		5		7 13·7	24 44 S.
336	2458	31	η	2		7 19·4	29 4 S.
	CANIS MINOR. *The Lesser Dog.*						
337	2462	3	β	3		7 20·7	8 32 N.
338	2522	10	α	1	Dup.	7 33·0	5 32 N.
339	2673			5		7 56·0	2 40 N.
	CAPRICORNUS. *The Sea-Goat.*						
340	6972	5	α^1	4	} Quint. u.	20 11·0	12 53 S.
341	6974	6	α^2	3		20 11·4	12 55 S.
342	6991	8	ν	5		20 14·0	13 8 S.
343	6995	9	β	3½	Mult.	20 14·3	15 10 S.
344	7031	10	π	5		20 20·5	18 36 S.
345	7042	11	ρ	5	Dup. (iv.)	20 22·0	18 12 S.
346	7134	15	υ	5		20 33·2	18 34 S.
347	7177	16	ψ	4½		20 39·0	25 42 S.
348	7305	22	η	5		20 57·6	20 20 S.

CAPRICORNUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
349	7374	29		5		21 9·1	15 40 S.
350	7407	32	ι	5		21 15·6	17 21 S.
351	7445	34	ζ	4		21 19·8	22 56 S.
352	7506	39	ε	5		21 30·4	20 0 S.
353	7525	40	γ	4		21 33·5	17 12 S.
354	7539	41		5		21 35·2	23 48 S.
355	7543	43	κ	5		21 36·0	19 25 S.
356	7580	49	δ	3½		21 40·4	16 40 S.
357	7618	51	μ	5		21 46·8	14 7 S.

CASSIOPEIA. *Cassiopeia.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
358	8162	4		5		23 19·5	61 37 N.
359	8188			5		23 24·5	57 53 N.
360	8268	5	τ	5		23 41·2	57 59 N.
361	8344			5		23 55·5	60 33 N.
362	8366			5		23 58·9	60 39 N.
363	7	11	β	2½		0 2·8	58 29 N.
364	121	14	λ	5	Dup. (i.)	0 25·1	53 50 N.
365	126	15	κ	4		0 26·1	62 16 N.
366	153	17	ζ	4		0 30·3	53 14 N.
367	169	18	α	3	Var.	0 33·7	55 53 N.
368	189	20	π	5		0 36·8	46 22 N.
369	218	24	η	4	Dup. (v.)	0 41·8	57 11 N.
370	219	25	ν	5		0 42·0	50 19 N.
371	245			5		0 48·3	48 2 N.
372	253	27	γ	3		0 49·5	60 5 N.
373	339	33	θ	4½		1 3·8	54 31 N.
374	412	36	ψ	4½	Trip.	1 17·5	67 30 N.
375	416	37	δ	3		1 18·0	59 37 N.
376	438	38	A	5		1 22·3	69 39 N.
377	564	45	ε	3		1 45·8	63 5 N.
378	595	48		5		1 52·1	70 19 N.
379	600	50		4		1 53·2	71 50 N.
380	744		ι	4	Dup. (ii.)	2 19·2	66 52 N.
381	1001			5		3 9·5	65 13 N.
382	1211			5½		3 50·0	80 22 N.

CENTAURUS. *The Centaur.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
383	3866		π	4		11 15·6	53 50 S.
384	3941		λ	4		11 30·3	62 21 S.

CENTAURUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
385	4087		δ	3		12 2·1	50 3 S.
386	4103		ρ	4		12 5·4	51 42 S.
387	4197		σ	$4\frac{1}{2}$		12 21·6	49 34 S.
388	4202			5		12 22·0	38 23 S.
389	4251		τ	5		12 31·1	47 53 S.
390	4262			5		12 33·4	39 20 S.
391	4264		γ	3	Dup. (i.)	12 34·9	48 18 S.
392	4321			5		12 46·8	39 32 S.
393	4325			5		12 47·6	56 32 S.
394	4379		ξ^2	5		12 59·9	49 16 S.
395	4409			5		13 4·5	42 44 S.
396	4458		ι	3		13 13·9	36 5 S.
397	4507			$4\frac{1}{2}$		13 24·1	38 47 S.
398	4549		ϵ	3		13 32·3	52 51 S.
399	4579	1	i	5		13 38·9	32 26 S.
400	4580			5		13 39·1	50 50 S.
401	4601		ν	$3\frac{1}{2}$		13 42·3	41 5 S.
402	4602		μ	$3\frac{1}{2}$		13 42·4	41 53 S.
403	4603	2	g	5		13 42·5	33 51 S.
404	4623	3	k	$4\frac{1}{2}$		13 44·9	32 24 S.
405	4629	4	h	5		13 46·3	31 20 S.
406	4638		ζ	3		13 48·0	46 42 S.
407	4653		ϕ	$4\frac{1}{2}$		13 51·0	41 32 S.
408	4654		υ^1	5		13 51·3	44 13 S.
409	4668		υ^2	5		13 54·2	45 1 S.
410	4669		β	1		13 55·4	59 48 S.
411	4681		χ	5		13 58·7	40 36 S.
412	4686	5	θ	$2\frac{1}{2}$		13 59·6	35 47 S.
413	4745		ψ	5		14 13·3	37 20 S.
414	4759			5		14 15·7	38 58 S.
415	4811		η	3		14 27·9	41 38 S.
416	4831		α^1	4	Dup.	14 31·4	60 20 S.
417	4832		α^2	1	Dup.	14 31·5	60 20 S.
418	4842			5		14 34·5	37 16 S.
419	4852			5		14 36·3	34 39 S.
420	4928		κ	3		14 51·4	41 37 S.

CEPHEUS. *Cepheus.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
421	7005	1	κ	$4\frac{1}{2}$	Dup.	20 12·9	77 21 N.
422	7098	2	θ	5		20 27·6	62 35 N.
423	7215			5		20 42·4	57 9 N.

CEPHEUS—*continued.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
424	7220	3	η	3½		20 42·9	61 22 N.
425	7299			5		20 53·0	80 6 N.
426	7281			5		20 53·1	56 26 N.
427	7377			5		21 8·8	59 28 N.
428	7416	5	α	3		21 15·7	62 5 N.
429	7428	6		5		21 16·9	64 22 N.
430	7493	8	β	3	Dup. (vi.)	21 27·1	70 2 N.
431	7495			5		21 27·7	59 56 N.
432	7510			5½		21 28·4	80 0 N.
433	7542	9		5		21 34·7	61 32 N.
434	7588	11		4½		21 40·2	70 45 N.
435	7595	10	ν	4½		21 42·0	60 34 N.
436	7610			5		21 44·9	69 34 N.
437	7686	16		5		21 57·5	72 36 N.
438	7699	18		5		22 0·3	62 36 N.
439	7700	17	ξ	5	Dup. (iv.)	22 0·3	64 3 N.
440	7749	21	ζ	4		22 6·7	57 37 N.
441	7758	24		5		22 7·5	71 45 N.
442	7778	23	ε	4½		22 10·6	56 27 N.
443	7848	27	δ	4½	Dup. Var.	22 24·7	57 48 N.
444	7857	28		5½		22 25·8	78 10 N.
445	7896	31		5		22 32·8	73 1 N.
446	7902	30		5		22 34·4	62 58 N.
447	7961			5		22 44·8	55 16 N.
448	7967	32	ι	4		22 45·4	65 34 N.
449	7973			5		22 46·7	61 3 N.
450	7990			5½		22 47·9	82 31 N.
451	8026			5½		22 55·4	83 42 N.
452	8039			5		22 59·0	66 34 N.
453	8074	33	π	5	Trip.	23 4·1	74 44 N.
454	8180			5		23 22·2	69 42 N.
455	8238	35	γ	3		23 34·4	76 58 N.
456	8273			5		23 42·2	67 8 N.
457	8314			5		23 49·0	73 45 N.
458	2157	51		5		6 43·8	87 15 N.

CETUS. *The Sea-Monster.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
459	8358	2		4		23 57·6	18 0 S.
460	62	8	ι	4		0 13·3	9 30 S.
461	196	16	β	2½		0 37·6	18 39 S.
462	200	17	φ¹	5		0 38·1	11 16 S.

CETUS—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
463	242	20		5		0 46·9	1 48 S.
464	332	31	η	3½		1 2·6	10 49 S.
465	420	45	θ	3		1 18·0	8 48 S.
466	429	46		5		1 19·7	15 13 S.
467	536	52	τ	3½		1 38·5	16 34 S.
468	559	53	χ	5		1 43·7	11 17 S.
469	565	55	ζ	3		1 45·5	10 56 S.
470	618	59	υ	4½		1 54·3	21 40 S.
471	684	65	ξ^1	5		2 6·6	8 17 N.
472	720	68	ο	2	Var. to 7. Dup.	2 13·3	3 31 S.
473	754	72	ρ	5		2 20·2	12 50 S.
474	760	73	ξ^2	4		2 21·8	7 56 N.
475	781	76	σ	5		2 26·4	15 46 S.
476	794	78	ν	4½	Dup. (iv.) u.	2 29·6	5 5 N.
477	811	82	δ	4		2 33·3	0 11 S.
478	815	83	ε	4½		2 33·8	12 23 S.
479	837	86	γ	3	Dup. (iii.)	2 37·1	2 44 N.
480	847	89	π	4		2 38·4	14 22 S.
481	949	92	α	2½	Dup. Var. (?)	2 56·0	3 37 N.
482	1028	96	κ^1	5		3 13·1	2 56 N.

CHAMÆLEON. *The Chameleon.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
483	2849		α	4½		8 21·6	76 32 S.
484	2870		θ	5		8 24·2	77 6 S.
485	3023		η	5		8 45·4	78 31 S.
486	3660		γ	5		10 34·1	77 59 S.
487	3724		δ^2	5		10 44·6	79 54 S.
488	4048		ε	5	Dup. (ii.)	11 53·7	77 33 S.
489	4131		β	5		12 11·3	78 39 S.

CIRCINUS. *The Compass.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
490	4835		α	4		14 32·8	64 27 S.
491	5011		β	5		15 8·1	58 21 S.

COLUMBA. *Noah's Dove.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
492	1650		ο	5		5 13·9	35 1 S.
493	1739		ε	4		5 27·0	35 34 S.
494	1756			5		5 28·8	38 36 S.
495	1802		α	2		5 35·3	34 8 S.

COLUMBA—*continued.*

No.	B.A.C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
496	1878		β	3		5 46·7	35 48 S.
497	1891		λ	5		5 48·8	33 49 S.
498	1922		γ	4		5 53·3	35 17 S.
499	1982		θ	5		6 3·4	37 14 S.
500	2034		κ	4½		6 12.3	35 6 S.
	COMA BERENICES. *Berenice's Hair.*						
501	4125	6		5		12 9·9	15 34 N.
502	4127	7		5		12 10·3	24 37 N.
503	4156	11		5		12 14·7	18 27 N.
504	4169	12		5	Dup.	12 16·5	26 31 N.
505	4181	13		5		12 18·3	26 46 N.
506	4191	14		5		12 20·4	27 54 N.
507	4195	15	γ	4½		12 21·0	28 54 N.
508	4196	16		5		12 21·0	27 29 N.
509	4240	23		4½		12 28·9	23 17 N.
510	4290	27		5		12 40·7	17 14 N.
511	4328	35		5		12 47·4	21 54 N.
512	4351	36		4½		12 53·0	18 4 N.
513	4360	37		5		12 54·5	31 26 N.
514	4387	39		5		13 0·5	21 48 N.
515	4390	41		4		13 1·4	28 16 N.
516	4406	42	α	4½	Dup. (i.)	13 4·2	18 10 N.
517	4421	43	β	4½		13 6·3	28 29 N.
	CORONA AUSTRALIS. *The Southern Crown.*						
518	6296		θ	5		18 25·0	42 24 S.
519	6511		γ	5	Dup. (iii.)	18 58·3	37 14 S.
520	6523		δ	5		19 0·0	40 41 S.
521	6535		α	4½		19 1·3	38 5 S.
522	6541		β	5		19 1·8	39 32 S.
	CORONA BOREALIS. *The Northern Crown.*						
523	5098	3	β	4		15 22·9	29 31 N.
524	5131	4	θ	4½		15 28·1	31 46 N.
525	5143	5	α	2½		15 29·6	27 7 N.
526	5155	6	μ	5		15 30·9	39 25 N.
527	5178	7	ζ	5	Dup. (iv.)	15 34·9	37 2 N.
528	5192	8	γ	5	Dup. (i.)	15 37·7	26 41 N.

CORONA BOREALIS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
529	5244	10	δ	$4\frac{1}{2}$		15 44·6	26 26 N.
530	5259	11	κ	5		15 46·7	36 2 N.
531	5302	13	ϵ	$4\frac{1}{2}$		15 52·6	27 14 N.
532	5473	19	ξ	5		16 17·4	31 10 N.
533	5479	20	ν^1	5		16 17·8	34 5 N.
534	5480	21	ν^2	5		16 18·0	33 59 N.
		CORVUS.	*The Crow.*				
535	4090	1	α	$4\frac{1}{2}$		12 2·2	24 3 S.
536	4097	2	ϵ	4		12 4·0	21 57 S.
537	4124	4	γ	3		12 9·6	16 53 S.
538	4211	7	δ	3		12 23·7	15 51 S.
539	4226	8	η	$4\frac{1}{2}$		12 25·9	15 32 S.
540	4234	9	β	$2\frac{1}{2}$		12 28·1	22 44 S.
		CRATER.	*The Cup.*				
541	3766	7	α	4		10 53·9	17 40 S.
542	3826	11	β	4		11 5·8	22 10 S.
543	3859	12	δ	$3\frac{1}{2}$		11 13·3	14 8 S.
544	3881	14	ϵ	5		11 18·6	10 12 S.
545	3883	15	γ	4	Dup.(iii.) u.	11 18·9	17 1 S.
546	3943	21	θ	4		11 30·6	9 8 S.
547	3978	27	ζ	4		11 38·7	17 41 S.
		CRUX.	*The Cross.*				
548	4078		η	$4\frac{1}{2}$		12 0·6	63 57 S.
549	4120		δ	3		12 8·8	58 5 S.
550	4133		ζ	5		12 11·9	63 20 S.
551	4158		ϵ	4		12 14·9	59 44 S.
552	4186			$4\frac{1}{2}$		12 19·9	62 27 S.
553	4187		α	1		12 19·9	62 26 S.
554	4215		γ	2		12 24·5	56 26 S.
555	4289		β	2		12 40·7	59 2 S.
		CYGNUS.	*The Swan.*				
556	6623	1	κ	4	Dup.(viii.)	19 14·3	53 9 N.
557	6690	6	β	3	Dup.	19 25·9	27 43 N.
558	6697	10	ι^2	5		19 26·7	51 28 N.

CYGNUS—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
559	6734	13	θ	4		19 33·2	49 57 N.
560	6740	12	ϕ	4		19 34·6	29 53 N.
561	6748			5		19 36·0	54 41 N.
562	6771	15		5		19 40·0	37 4 N.
563	6779	18	δ	3½	Dup. (ii.) u.	19 41·2	44 50 N.
564	6780			5		19 40·9	57 44 N.
565	6784	17	χ	5	Dup. Var.	19 41·9	33 27 N.
566	6817			5		19 46·5	40 18 N.
567	6849	22		5		19 51·6	38 10 N.
568	6851	21	η	5	Var.	19 51·8	34 46 N.
569	6857			5		19 53·1	40 3 N.
570	6937	28	b^2	5		20 5·0	36 29 N.
571	6959			5		20 9·2	51 6 N.
572	6965	31	o^2	4	Trip.	20 9·9	46 23 N.
573	6976	33		4½		20 10·6	56 12 N.
574	6983	32		4½		20 11·8	47 21 N.
575	7022	37	γ	3		20 17·9	39 52 N.
576	7027			5		20 18·5	40 39 N.
577	7029	39		5		20 19·1	31 48 N.
578	7067	41		4½		20 24·5	29 58 N.
579	7085	45	ω^2	5		20 26·3	48 33 N.
580	7091	46	ω^3	5		20 27·6	48 49 N.
581	7171	50	α	1	Dup. u.	20 37·3	44 51 N.
582	7204	53	ϵ	3		20 41·4	33 31 N.
583	7213	54	λ	5		20 42·7	36 3 N.
584	7253	57		5		20 49·0	43 56 N.
585	7277	58	ν	4		20 52·7	40 42 N.
586	7333	62	ξ	4		21 0·6	43 27 N.
587	7336	61		5½		21 1·5	38 10 N.
588	7345	63	f^2	5		21 2·5	47 10 N.
589	7368	64	ζ	3		21 7·8	29 44 N.
590	7385	65	τ	5		21 10·0	37 32 N.
591	7398	67	σ	4½		21 12·7	38 53 N.
592	7399	66	υ	4½		21 13·0	34 24 N.
593	7480	71	g	5		21 25·0	46 1 N.
594	7503	73	ρ	4½		21 29·5	45 4 N.
595	7560	80	π^1	4½		21 37·8	50 38 N.
596	7568	78	μ^1	5	Dup. (iv.)	21 38·8	28 12 N.
597	7598	81	π^2	5		21 42·4	48 45 N.

DELPHINUS.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	DELPHINUS. *The Dolphin.*					h. m.	° ′
598	7088	2	ε	4		20 27·5	10 54 N.
599	7107	4	ζ	5		20 29·7	14 16 N.
600	7121	6	β	4	Trip.	20 31·9	14 11 N.
601	7137	8	θ	4½		20 33·1	12 54 N.
602	7149	9	α	3½		20 34·1	15 29 N.
603	7173	11	δ	4		20 37·9	14 39 N.
604	7200	12	γ	4	Dup. (v.)	20 40·1	15 42 N.
	DORADO. *The Sword-Fish.*						
605	1331		γ	4		4 12·9	51 47 S.
606	1438		α	3		4 31·3	55 18 S.
607	1600		ζ	5		5 3·4	57 38 S.
608	1612		μ	5		5 5·8	61 58 S.
609	1659		θ	5		5 13·9	67 19 S.
610	1791		β	4		5 32·6	62 34 S.
611	1868		δ	4½		5 44·5	65 46 S.
612	1905		ε	5		5 50·0	66 55 S.
	DRACO. *The Dragon.*						
613	3199			5		9 19·8	81 51 N.
614	3528			5½		10 16·3	83 10 N.
615	3914	1	λ	3½		11 24·3	70 0 N.
616	4112			5		12 6·6	78 17 N.
617	4239	5	κ	3½		12 28·4	70 27 N.
618	4646	10	*i*	4½		13 47·9	65 19 N.
619	4696	11	α	3½		14 1·1	64 57 N.
620	4949			5		14 55·7	66 25 N.
621	5097	12	ι	3		15 21·8	59 23 N.
622	5279			5		15 49·5	56 11 N.
623	5348	13	θ	3		15 59·7	58 53 N.
624	5406			5		16 6·0	68 8 N.
625	5459			5		16 15·3	60 4 N.
626	5502			5		16 21·8	55 29 N.
627	5512	14	η	3		16 22·4	61 47 N.
628	5545	15	A	4½		16 28·2	69 2 N.
629	5628	18	*g*	5		16 40·1	64 49 N.
630	5643			5		16 43·0	57 0 N.
631	5740	19	h^1	5		16 55·4	65 19 N.

DRACO—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
632	5785	21	μ^1	4	Dup. (iii.)	17 2·8	54 38 N.
633	5823	22	ζ	3		17 8·4	65 52 N.
634	5937	23	β	2½		17 27·7	52 23 N.
635	5950	24	ν^1	5	Dup.	17 29·8	55 16 N.
636	5951	25	ν^2	5	Dup.	17 29·9	55 15 N.
637	5972	27	f	5		17 32·5	68 13 N.
638	6006	28	ω	4		17 37·7	68 49 N.
639	6047	31	ψ^1	4½	Dup. (viii.)	17 44·1	72 12 N.
640	6079	32	ξ	3½		17 51·5	56 54 N.
641	6091	33	γ	2	Dup.	17 53·8	51 30 N.
642	6114	35		5		17 54·8	76 59 N.
643	6206	40		5		18 9·0	79 59 N.
644	6208	41		5	Dup. (vii.)	18 9·1	79 59 N.
645	6224	36		5		18 13·2	64 21 N.
646	6255			5		18 18·5	49 4 N.
647	6289	39	b	5		18 22·2	58 44 N.
648	6297	43	ϕ	5	Dup. (i.)	18 22·5	71 16 N.
649	6302	44	χ	4½		18 23·2	72 41 N.
650	6350			5		18 31·2	52 15 N.
651	6395	46	c	5		18 40·3	55 25 N.
652	6419			5		18 44·0	52 51 N.
653	6469			5		18 48·8	73 57 N.
654	6452			5		18 48·9	52 49 N.
655	6463	47	o	5	Dup.	18 49·4	59 14 N.
656	6478	50		5		18 50·2	75 17 N.
657	6496	48		5		18 54·7	57 39 N.
658	6510	52	υ	5		18 55·9	71 8 N.
659	6583	53		5		19 9·4	56 39 N.
660	6601	54		5		19 11·8	57 30 N.
661	6612	57	δ	3		19 12·5	67 27 N.
662	6650	60	τ	4½		19 17·9	73 8 N.
663	6662	58	π	4		19 20·1	65 29 N.
664	6735	61	σ	5		19 32·6	69 27 N.
665	6905	64	e	5		20 0·2	64 29 N.
666	6926	67	ρ	4		20 2·3	67 32 N.
667	6932	66		5		20 3·7	61 39 N.
668	7178	75		5½		20 35·7	81 1 N.
669	7291	76		5		20 51·2	82 5 N.
670	7381	77		5½		21 7·9	77 38 N.
671	7597	78		5		21 41·6	71 46 N.

EQUULEUS.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	EQUULEUS. *The Little Horse.*					h. m.	° ′
672	7350	5	γ	5		21 4·5	9 39 N.
673	7372	7	δ	4½	Dup. (viii.) u.	21 8·7	9 31 N.
674	7380	8	α	4½		21 9·8	4 45 N.
	ERIDANUS. *The River Eridanus.*						
675	507		α	1		1 33·3	57 51 S.
676	550		q^2	5		1 41·5	54 8 S.
677	596		χ	4	Dup. u.	1 51·3	52 12 S.
678	717		φ	4		2 12·2	52 4 S.
679	763		κ	4½		2 22·6	48 14 S.
680	828			5		2 35·2	43 24 S.
681	832		ι	4		2 35·9	40 22 S.
682	856	1	τ^1	4½		2 39·5	19 5 S.
683	887	2	τ^2	4½		2 45·6	21 30 S.
684	910	3	η	3		2 50·6	9 23 S.
685	937		θ	3½	Dup. (v.)	2 53·7	40 47 S.
686	952	9	ρ^2	5		2 56·8	8 9 S.
687	954	11	τ^3	4		2 57·1	24 6 S.
688	959	10	ρ^3	5		2 58·4	8 4 S.
689	997	12	α	3½	Dup. (iv.)	3 7·0	29 28 S.
690	1013	13	ζ	4		3 10·0	9 16 S.
691	1037	16	τ^4	3½		3 14·2	22 12 S.
692	1044			4½		3 15·1	43 32 S.
693	1090	17		4½		3 24·7	5 29 S.
694	1100	18	ε	3½		3 27·3	9 52 S.
695	1104	19	τ^5	4		3 28·5	22 2 S.
696	1125			5		3 32·8	40 40 S.
697	1150			5		3 37·5	32 19 S.
698	1148	23	δ	3½		3 37·5	10 10 S.
699	1159		υ^1	5		3 38·4	37 41 S.
700	1168	26	π	5		3 40·5	12 29 S.
701	1181	27	τ^6	4½		3 41·7	23 36 S.
702	1191	28	τ^7	5		3 42·5	24 15 S.
703	1199			5		3 44·2	37 59 S.
704	1201		υ^2	4		3 45·0	36 34 S.
705	1216	32		5	Dup. (iv.)	3 48·3	3 19 S.
706	1217	33	τ^8	5		3 48·6	24 58 S.
707	1220		υ^3	5		3 49·1	35 5 S.
708	1234	34	γ	2½		3 52·4	13 51 S.

ERIDANUS—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
709	1243	36	τ^9	5		3 54·8	24 21 S.
710	1245	35		5		3 55·5	1 53 S.
711	1290	38	o^1	4½		4 6·0	7 9 S.
712	1303	39	A	5		4 8·7	10 33 S.
713	1309	40	o^2	4½		4 9·7	7 50 S.
714	1333	41	υ^4	3½		4 13·4	34 6 S.
715	1372	43	υ^5	4		4 19·6	34 18 S.
716	1419	47		5		4 28·4	8 29 S.
717	1422	50	υ^6	4½		4 28·8	30 1 S.
718	1429	48	ν	4		4 30·3	3 36 S.
719	1433	52	υ^7	3½		4 30·9	30 49 S.
720	1441	53		4		4 32·7	14 32 S.
721	1451	54		4		4 35·2	19 54 S.
722	1469	57	μ	5	Dup. (iv.)	4 39·5	3 29 S.
723	1507	61	ω	5		4 47·0	5 39 S.
724	1544	63		5		4 54·2	10 26 S.
725	1552	65	ψ	5		4 55·6	7 21 S.
726	1588	67	β	3		5 2·0	5 15 S.
727	1597	69	λ	4		5 3·4	8 55 S.

FORNAX. *The Furnace.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
728	688		μ	5		2 7·6	31 17 S.
729	879		β	5		2 44·1	32 55 S.

GEMINI. *The Twins.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
730	1938	1		5		5 56·8	23 16 N.
731	2002	7	η	4		6 7·6	22 32 N.
732	2047	13	μ	3	Dup.	6 15·7	22 35 N.
733	2090	18	ν	4		6 21·8	20 17 N.
734	2163	24	γ	2½		6 30·8	16 31 N.
735	2194	27	ϵ	3	Dup.	6 36·6	25 15 N.
736	2206	31	ξ	4		6 38·6	13 2 N.
737	2237	34	θ	5		6 44·9	34 6 N.
738	2305	43	ζ	4	Var.	6 57·0	20 45 N.
739	2340	46	τ	5		7 3·5	30 26 N.
740	2362	51		5		7 6·5	16 22 N.
741	2398	54	λ	4½	Dup. (v.) u.	7 11·2	16 45 N.
742	2410	55	δ	3	Dup. (iv.) u.	7 13·0	22 12 N.
743	2442	60	ι	4		7 18·3	28 2 N.
744	2464	62	ρ	5		7 21·4	32 1 N.

GEMINI—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
745	2486	68		5		7 26·8	16 5 N.
746	2485	66	α^2	$1\frac{1}{2}$	Dup. (iii.)	7 27·0	32 9 N.
747	2493	69	υ	5		7 28·5	27 10 N.
748	2540	75	σ	5		7 35·8	29 10 N.
749	2551	77	κ	4	Dup.(iv.) u.	7 37·2	24 41 N.
750	2555	78	β	2	Mult.	7 38·0	28 19 N.
751	2617	83	ϕ	5		7 46·2	27 5 N.

GRUS. *The Crane.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
752	7613		γ	3		21 46·7	37 58 S.
753	7684		λ	5		21 58·9	40 7 S.
754	7692		α	2		22 0·6	47 33 S.
755	7756		μ^1	5		22 8·4	41 56 S.
756	7828		δ^1	4		22 22·1	44 7 S.
757	7830		δ^2	5		22 22·6	44 22 S.
758	7904		β	3		22 35·6	47 32 S.
759	7925		η	5		22 38·3	54 8 S.
760	7946		ϵ	4		22 41·3	51 57 S.
761	8008		ζ	5		22 53·8	53 24 S.
762	8043		θ	5		23 0·1	44 10 S.
763	8067		ι	5		23 3·6	45 54 S.

HERCULES. *Hercules.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
764	5338	6	υ	5		15 59·1	46 22 N.
765	5388	11	ϕ	5		16 5·0	45 15 N.
766	5463	22	τ	4		16 16·1	46 36 N.
767	5466	20	γ	$3\frac{1}{2}$	Dup.	16 16·6	19 26 N.
768	5490	24	ω	5		16 19·9	14 19 N.
769	5496	25		5		16 21·1	37 40 N.
770	5523	30	*g*	5		16 24·7	42 9 N.
771	5525	27	β	$2\frac{1}{2}$		16 25·1	21 45 N.
772	5532	29	*h*	$4\frac{1}{2}$		16 27·0	11 45 N.
773	5552	35	σ	4		16 30·2	42 42 N.
774	5596	42		5		16 35·5	49 20 N.
775	5604	40	ζ	3	Dup. (i.)	16 36·8	31 49 N.
776	5617	44	η	3	Dup. (iv.)	16 38·8	39 9 N.
777	5621	43	*i*	5		16 40·1	8 48 N.
778	5648	47	*k*	5		16 44·5	7 28 N.
779	5667	52		5		16 45·7	46 12 N.
780	5666	50		5		16 46·0	30 1 N.

HERCULES—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
781	5693	53		5		16 48·4	31 54 N.
782	5731	58	ε	3		16 55·7	31 6 N.
783	5747	59	*d*	5		16 57·2	33 45 N.
784	5765	60		5		16 59·8	12 54 N.
785	5788			5		17 3·8	36 6 N.
786	5821	64	α	3½	Dup.(iv.) Var.	17 9·2	14 32 N.
787	5828	65	δ	4	Dup. (viii.)	17 10·1	24 59 N.
788	5834	67	π	3½		17 10·9	36 57 N.
789	5842	68	*u*	4½		17 12·9	33 14 N.
790	5847	69	*e*	4½		17 13·5	37 25 N.
791	5886	75	ρ	4	Dup. (iii.)	17 19·6	37 16 N.
792	5922	76	λ	4½	Orange-col[d].*	17 25·9	26 12 N.
793	5990	85	ι	4		17 36·1	46 4 N.
794	6021	86	μ	4	Dup.	17 41·8	27 48 N.
795	6082	91	θ	4		17 52·1	37 16 N.
796	6084	92	ξ	4		17 53·1	29 16 N.
797	6087	94	ν	5		17 53·9	30 12 N.
798	6094	93		5		17 54·7	16 46 N.
799	6110	96		5		17 57·3	20 50 N.
800	6129			5		18 0·0	48 28 N.
801	6150	103	ο	4		18 2·9	28 45 N.
802	6178	104	A	5		18 7·4	31 22 N.
803	6223	105		5		18 14·3	24 24 N.
804	6387	110		5		18 40·5	20 26 N.
805	6453	113		5		18 49·7	22 30 N.
					HOROLOGIUM. *The Clock.*		
806	931			5		2 52·3	63 36 S.
807	956			5		2 56·5	64 33 S.
808	1299		δ	5		4 6·8	42 18 S.
809	1315		α	5		4 10·0	42 35 S.
810	1348			5		4 15·5	44 34 S.
					HYDRA. *The Sea-Serpent.*		
811	2901	4	δ	4		8 31·3	6 7 N.
812	2911	5	σ	5		8 32·5	3 46 N.

* This star very nearly marks the point towards which, according to the calculations of Sir W. Herschel, the solar system is at present travelling.

HYDRA—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
813	2945	7	η	5		8 37·0	3 50 N.
814	2971	11	ε	4	Dup. (iii.)	8 40·4	6 52 N.
815	2978	13	ρ	5		8 42·1	6 17 N.
816	3032	16	ζ	4		8 49·1	6 24 N.
817	3146	22	θ	4½		9 8·1	2 49 N.
818	3223	30	α	2	Var.	9 21·7	8 8 S.
819	3226			5		9 21·8	5 33 S.
820	3303	35	ι	5		9 33·7	0 36 S.
821	3311	38	κ	5		9 34·6	13 47 S.
822	3372	39	υ^1	5		9 45·7	14 17 S.
823	3473	41	λ	4½		10 4·7	11 46 S.
824	3568	42	μ	4	Var.	10 20·3	16 13 S.
825	3646		ϕ^2	5		10 32·7	16 15 S.
826	3715		ν	4		10 43·7	15 34 S.
827	3793		χ^1	5		10 59·6	26 39 S.
828	3794		χ^2	5		11 0·2	26 38 S.
829	3815			5		11 2·9	27 26 S.
830	3822			5		11 4·1	31 43 S.
831	3922			5		11 26·3	28 36 S.
832	3928			4		11 27·1	31 11 S.
833	4015		β	4	Dup. (iii.)	11 46·8	33 14 S.
834	4395	45	ψ	4½		13 2·6	22 29 S.
835	4450	46	γ	4	Dup. u.	13 12·4	22 32 S.
836	4685	49	π	4½		13 59·6	26 6 S.
837	4708	50		5		14 5·9	26 42 S.
838	4880	56		5		14 40·7	25 35 S.
839	4882	57		5		14 40·9	26 8 S.
840	4891	58		5		14 43·2	27 27 S.

HYDRUS. *The Water-snake.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
841	88		β	3		0 19·4	77 56 S.
842	589		η^1	5		1 49·5	68 32 S.
843	603		η^2	4½		1 51·9	68 14 S.
844	623		α	3		1 55·0	62 9 S.
845	635			5		1 56·5	66 38 S.
846	756		δ	4		2 19·6	69 12 S.
847	849		ε	5		2 37·7	68 47 S.
848	882		ζ	5		2 43·7	68 7 S.
849	982		θ	5		3 2·0	72 23 S.
850	1056			5		3 16·7	67 22 S.
851	1070			5		3 18·8	77 49 S.

HYDRUS—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
852	1215			5		3 46·0	72 18 S.
853	1230		γ	3		3 49·2	74 36 S.
			INDUS. *The Indian.*				
854	7096		α	3	Dup. u.	20 29·1	47 43 S.
855	7228		β	4		20 45·4	58 54 S.
856	7423		γ	5		21 17·7	55 13 S.
857	7633		δ	5		21 49·7	55 34 S.
858	7634		κ^1	5		21 50·0	59 35 S.
			LACERTA. *The Lizard.*				
859	7746			5		22 6·5	50 14 N.
860	7765			5		22 8·7	39 7 N.
861	7777	1		5		22 10·7	37 9 N.
862	7800	2		5		22 16·1	45 56 N.
863	7815	3	β	4½		22 18·9	51 38 N.
864	7820	4		5		22 19·7	48 52 N.
865	7845	5		5		22 24·6	47 6 N.
866	7855	7	α	4		22 26·4	49 40 N.
			LEO. *The Lion.*				
867	3204	1	κ	5		9 17·7	26 42 N.
868	3246	4	λ	4½		9 24·9	23 30 N.
869	3250	5	ξ	5		9 25·5	11 50 N.
870	3312	14	ο	4		9 34·8	10 26 N.
871	3331	17	ε	3		9 39·1	24 20 N.
872	3371	24	μ	3	Dup.	9 45·9	26 34 N.
873	3415	29	π	4½		9 53·9	8 37 N.
874	3453	30	η	3½		10 0·8	17 21 N.
875	3457	31	A	5		10 1·5	10 35 N.
876	3459	32	α	1	Dup. u.	10 2·0	12 33 N.
877	3508	36	ζ	4½		10 10·0	24 1 N.
878	3523	41	γ	2	Dup. (iii.)	10 13·4	20 27 N.
879	3609	47	ρ	4		10 26·5	9 56 N.
880	3742	54		4½		10 49·1	25 23 N.
881	3768	58	d	5		10 54·4	4 16 N.
882	3776	60	b	5		10 55 9	20 49 N.
883	3788	63	χ	4½		10 58·8	7 59 N.
884	3834	68	δ	2½		11 7·7	21 11 N.

LEO—*continued.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
885	3838	70	θ	3		11 7·9	16 5 N.
886	3842	72		5		11 8·8	23 45 N.
887	3848	74	φ	5		11 10·6	3 0 S.
888	3862	77	σ	4		11 15·0	6 41 N.
889	3877	78	ι	4	Dup. (iii.)	11 17·7	11 12 N.
890	3900	84	τ	4		11 21·8	3 31 N.
891	3916	87	e	4½		11 24·2	2 20 S.
892	3946	91	υ	4½		11 30·8	0 10 S.
893	3990	93		4		11 41·8	20 53 N.
894	3995	94	β	2½	Dup.	11 42·9	15 15 N.
	LEO MINOR.	*The Lesser Lion.*					
895	3261	10		5		9 26·9	36 56 N.
896	3446	21		5		10 0·4	35 50 N.
897	3560	30		4½		10 19·0	34 25 N.
898	3572	31	β	4½		10 21·0	37 19 N.
899	3610	34		5		10 26·7	35 36 N.
900	3640	37		4½		10 32·0	32 36 N.
901	3685	42		4½		10 39 2	31 19 N.
902	3728	46		4½		10 46·6	34 52 N.
	LEPUS.	*The Hare.*					
903	1559			5		4 57·3	26 27 S.
904	1575	2	ε	4		5 0·9	22 32 S.
905	1608	3	ι	4½	Dup.	5 6·7	12 1 S.
906	1616	5	μ	5		5 7·5	16 21 S.
907	1617	4	κ	5	Dup. (iii.)	5 7·6	13 5 S.
908	1653	6	λ	4½		5 14·1	13 18 S.
909	1715	9	β	4		5 23·1	20 51 S.
910	1741	11	α	3½		5 27·4	17 55 S.
911	1823	13	γ	4	Dup.	5 39·5	22 29 S.
912	1840	14	ζ	4½		5 41·5	14 51 S.
913	1871	15	δ	5		5 46·2	20 53 S.
914	1901	16	η	4		5 50·9	14 11 S.
915	1959	18	θ	4½		6 0·7	14 55 S.
	LIBRA.	*The Balance.*					
916	4890	7	μ	5		14 42·7	13 39 S.
917	4895	9	α	3	Dup. u.	14 44·2	15 32 S.

LIBRA—*continued.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
918	4922	15	ξ^2	5	Trip.	14 50·3	10 55 S.
919	4939	19	δ	4½		14 54·6	8 2 S.
920	4950	20		3½		14 57·1	24 48 S.
921	4970	21	ν^1	5		14 59·9	15 47 S.
922	5034	27	β	2½	Dup. u.	15 10·6	8 56 S.
923	5089	32	ζ^1	4		15 21·5	16 18 S.
924	5125	37		4		15 27·6	9 39 S.
925	5134	38	γ	4½		15 28·8	14 23 S.
926	5138	39		4		15 29·7	27 44 S.
927	5151	40		4½		15 31·3	29 23 S.
928	5176	43	κ	5		15 35·0	19 17 S.
929	5190	44	η	4½		15 37·3	15 17 S.
930	5251	45	λ	4		15 46·4	19 48 S.
931	5257	46	θ	4½		15 47·0	16 23 S.
932	5290	48		4½		15 51·5	13 56 S.
933	5324	51		4½	Trip.	15 57·8	11 2 S.

LUPUS. *The Wolf.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
934	4734		ι	4½		14 11·7	45 30 S.
935	4768		τ^1	5		14 18·4	44 41 S.
936	4770		τ^2	5		14 18·5	44 50 S.
937	4801		σ	5		14 24·5	49 56 S.
938	4821		ρ	5		14 29·8	48 54 S.
939	4839		α	3		14 34·0	46 52 S.
940	4892		o	5		14 43·8	43 5 S.
941	4924		β	3		14 50·7	42 39 S.
942	4948		π	5	Dup. (i.)	14 57·0	46 35 S.
943	4973		λ	5		15 0·8	44 49 S.
944	4986		κ	5		15 3·6	48 17 S.
945	4987		ζ	4		15 3·7	51 38 S.
946	5032	2		4½		15 10·0	29 42 S.
947	5028		μ	5		15 10·2	47 26 S.
948	5046		δ	4		15 13·5	40 13 S.
949	5049		ν^1	5		15 13·8	47 29 S.
950	5054		ϕ^1	5		15 14·2	35 50 S.
951	5056		ϵ	4½		15 14·5	44 16 S.
952	5060		ϕ^2	5		15 15·5	36 26 S.
953	5118		γ	3		15 27·2	40 46 S.
954	5139		ι	5		15 30·0	42 10 S.
955	5165			5		15 33·0	44 16 S.
956	5227	5	χ	4		15 43·3	33 16 S.

LUPUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
957	5268		ξ	4½		15 49·2	33 37 S.
958	5292		η	4½	Dup. (vi.)	15 52·2	38 3 S.
959	5331		θ	4½		15 58·7	36 28 S.
		LYNX.	*The Lynx.*				
960	1992	1		5		6 6·9	61 33 N.
961	2007	2		4½		6 9·1	59 3 N.
962	2248	15		5		6 46·9	58 35 N.
963	2349	18		5		7 5·4	59 51 N.
964	2379			5		7 9·4	49 41 N.
965	2407	19		5		7 13·1	55 30 N.
966	2697	27		5		7 59·4	51 51 N.
967	2776	30		5		8 10·7	58 7 N.
968	2793	31		5		8 14·6	43 35 N.
969	2792			5		8 14·7	53 36 N.
970	3059			4		8 52·9	42 16 N.
971	3097			5		8 58·9	38 56 N.
972	3162	38		4		9 11·4	37 19 N.
973	3178	40	α	4		9 13·8	34 54 N.
		LYRA.	*The Lyre.*				
974	6218			5		18 13·3	40 53 N.
975	6235	1	κ	4½		18 15·7	36 1 N.
976	6355	3	α	1	Dup. u.	18 32·9	38 40 N.
977	6390	4	ϵ^1	5	Dup. (iii.)	18 40·4	39 33 N.
978	6391	5	ϵ^2	5	Dup. (iii.)	18 40·4	39 29 N.
979	6392	6	ζ^1	5	Dup.	18 40·6	37 29 N.
980	6429	10	β	3	Quad. Var.	18 45·7	33 13 N.
981	6466	12	δ^2	5		18 50·3	36 45 N.
982	6475	13		5		18 51·7	43 47 N.
983	6491	14	γ	3	Dup. (Var?)	18 54·5	32 32 N.
984	6581	20	η	5	Dup. (viii.)	9 9·7	38 56 N.
985	6599	21	θ	5		9 12·2	37 55 N.
		MENSA.	*The Table Mountain.*				
986	1038			5		3 11·7	79 26 S.
987	1532			5		4 48·3	76 32 S.
988	1587			4½		4 59·2	75 8 S.

MICROSCOPIUM.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	MICROSCOPIUM. *The Microscope.*					h. m.	° ′
989	7207		α	4½		20 42·5	34 14 S.
	MONOCEROS. *The Unicorn.*						
990	1994			5		6 6·0	6 32 S.
991	2015	5		4½		6 9·0	6 15 S.
992	2126	13		5		6 26·4	7 26 N.
993	2216	17		5		6 40·8	8 10 N.
994	2222	18		5		6 41·6	2 33 N.
995	2358	22		4½		7 5·7	0 18 S.
996	2542	26	γ	4½	Dup. (i.)	7 35·6	9 16 S.
	MUSCA. *The Bee.*						
997	3984			4½		11 40·0	66 4 S.
998	4224		γ	4		12 25·3	71 28 S.
999	4245		α	4		12 30·0	68 28 S.
1000	4280		β	4		12 38·9	67 27 S.
1001	4353		δ	4		12 54·1	70 54 S.
1002	4426		η	5		13 7·1	67 15 S.
	NORMA. *The Rule.*						
1003	5323		δ	5		15 58·0	44 51 S.
1004	5425		γ^2	5		16 10·9	49 52 S.
	OCTANS. *The Octant.*						
1005	19		γ^3	5		0 4·5	82 52 S.
1006	4293		ι	5		12 42·5	84 28 S.
1007	4483		κ	5		13 21·8	85 10 S.
1008	4705		δ	5		14 7·8	83 7 S.
1009	5959		σ	6		18 25·4	89 18 S.
1010	7250		α	4½		20 50·2	77 29 S.
1011	7886		β	5		22 33·7	82 1 S.
1012	8290		γ^1	5		23 45·0	85 41 S.
1013	8319		γ^2	5		23 50·4	82 55 S.

OPHIUCHUS.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	OPHIUCHUS. *The Serpent-Bearer.*					h. m.	° ′
1014	5414	1	δ	3		16 8·1	3 23 S.
1015	5437	2	ε	3		16 12·0	4 24 S.
1016	5467	4	ψ	5		16 17·1	19 45 S.
1017	5477	5	ρ	5	Dup.	16 18·4	23 10 S.
1018	5489	7	χ	5		16 20·1	18 11 S.
1019	5494			5		16 21·2	7 19 S.
1020	5495	3	υ	5		16 21·3	8 6 S.
1021	5516	8	φ	4½		16 24·3	16 21 S.
1022	5520	10	λ	4	Dup. (i.)	16 24·9	2 15 N.
1023	5519	9	ω	5		16 25·0	21 12 S.
1024	5547	12		5		16 30·1	2 4 S.
1025	5548	13	ζ	3½		16 30·6	10 19 S.
1026	5579			5		16 34·7	17 30 S.
1027	5637	20		5		16 43·2	10 34 S.
1028	5688	23		5		16 48·2	5 57 S.
1029	5692	25	ι	4		16 48·3	10 22 N.
1030	5708	27	κ	4		16 52·0	9 34 N.
1031	5781	35	η	2½	Dup. (i.)	17 3·5	15 34 S.
1032	5802	37		5		17 6·8	10 44 N.
1033	5808	36	A^1	4½		17 7·5	26 25 S.
1034	5830	41		4½		17 10·5	0 18 S.
1035	5844	40	ξ	4½		17 13·8	20 59 S.
1036	5851	42	θ	3½		17 14·7	24 53 S.
1037	5876	44	*b*	5		17 19·1	24 4 S.
1038	5881	45	*d*	4		17 19·7	29 45 S.
1039	5893	49	σ	4½		17 20·6	4 15 N.
1040	5907	51	c^2	5		17 24·1	23 52 S.
1041	5941	55	α	2		17 29·4	12 39 N.
1042	5953	57	μ	5		17 31·3	8 2 S.
1043	5987	58		5		17 36·3	21 37 S.
1044	5996	59	β	3		17 37·6	4 37 N.
1045	6020	62	γ	4		17 41·9	2 45 N.
1046	6078	64	ν	4		17 52·4	9 45 S.
1047	6089	66		5		17 54·3	4 23 N.
1048	6092	67		4		17 54·7	2 56 N.
1049	6104	69	τ	5	Dup. (i.)	17 56·6	8 11 S.
1050	6123	70		4½	Dup. (iv.)	17 59·4	2 32 N.
1051	6143	72		4		18 1·7	9 33 N.

ORION.

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	ORION. *Orion.*					h. m.	° ′
1052	1486	1	π^1	4		4 43·3	6 45 N.
1053	1491	2	π^2	5		4 44·1	8 42 N.
1054	1495	3	π^3	4		4 44·8	5 24 N.
1055	1500	4	o^1	5		4 45·8	14 3 N.
1056	1514	8	π^5	4½		4 48·0	2 15 N.
1057	1525	9	o^2	5		4 49·6	13 19 N.
1058	1557	11		5		4 57·7	15 14 N.
1059	1591	15		5		5 2·8	15 27 N.
1060	1611	17	ρ	5		5 7·0	2 43 N.
1061	1623	19	β	1	Dup. (v.) u.	5 8·8	8 20 S.
1062	1638	20	τ	4	Trip. (vii.) (vi.) u.	5 11·8	6 59 S.
1063	1665	23	m	5	Dup. (viii.)	5 16·5	3 26 N.
1064	1684	28	η	4½		5 18·4	2 31 S.
1065	1687	24	γ	2		5 18·7	6 14 N.
1066	1700	30	ψ^2	5		5 20·6	2 59 N.
1067	1717	31		5		5 23·6	1 11 S.
1068	1722	32	A	5	Dup. (ii.)	5 24·4	5 51 N.
1069	1730	34	δ	2	Dup.	5 25·9	0 23 S.
1070	1731	36	υ	5		5 26·1	7 23 S.
1071	1748	37	ϕ^1	4½		5 28·2	9 24 N.
1072	1749	39	λ	4	Dup. (iv.)	5 28·5	9 51 N.
1073	1759	42	c	5		5 29·5	4 55 S.
1074	1762	44	ι	3½	Dup. (v.)	5 29·6	5 59 S.
1075	1765	46	ϵ	2½	Dup.	5 30·1	1 17 S.
1076	1766	40	ϕ^2	4½		5 30·3	9 13 N.
1077	1780	48	σ	4	Sept.	5 32·7	2 40 S.
1078	1785	49	d	5		5 33·1	7 17 S.
1079	1794	50	ζ	2	Dup. (iii.)	5 34·7	2 0 S.
1080	1843	53	κ	3		5 42·1	9 42 S.
1081	1876	54	χ^1	5		5 47·3	20 16 N.
1082	1883	58	α	1	Var.	5 48·7	7 24 N.
1083	1928	61	μ	5		5 55·8	9 39 N.
1084	1934	64	χ^2	5		5 56·4	19 42 N.
1085	1939	62	χ^4	5		5 56·8	20 9 N.
1086	1958	67	ν	4½		6 0·7	14 47 N.
1087	1990	70	ξ	5		6 5·1	14 14 N.
	PAVO. *The Peacock.*						
1088	5963		η	4½		17 34·0	64 40 S.
1089	6100		π	5		17 57·0	63 40 S.

PAVO—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1090	6126		ι	4½		18 1·1	61 34 S.
1091	6148			5		18 4·2	63 5 S.
1092	6253		ν	5		18 20·2	62 21 S.
1093	6315		ζ	4		18 29·0	71 32 S.
1094	6352			5		18 33·7	64 59 S.
1095	6360		θ	5		18 36·8	65 12 S.
1096	6383		λ	5		18 41·1	62 20 S.
1097	6405		κ	5		18 44·6	67 23 S.
1098	6801		ε	4		19 46·7	73 13 S.
1099	6873		δ	4		19 56·9	66 29 S.
1100	7004		α	2		20 16·2	57 7 S.
1101	7106		υ	5		20 31·0	67 11 S.
1102	7129		β	3		20 34·1	66 38 S.
1103	7165		σ	4½		20 37·9	69 13 S.
1104	7409		γ	3		21 18·5	65 55 S.

PEGASUS. *The Winged Horse.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1105	7418	1		4	Dup. Var.	21 16·5	19 18 N.
1106	7522	4		5		21 32·5	5 18 N.
1107	7561	8	ε	2½	Trip.	21 38·3	9 19 N.
1108	7567	9		4½		21 38·8	16 48 N.
1109	7571	10	κ	4	Dup.	21 39·2	25 4 N.
1110	7607	14		5		21 44·5	29 37 N.
1111	7689	22	ν	5		21 59·6	4 28 N.
1112	7706	24	ι	4	Dup. Var.	22 1·4	24 46 N.
1113	7721	27	π^1	5		22 3·9	32 35 N.
1114	7723	26	θ	4		22 4·2	5 36 N.
1115	7731	29	π^2	4		22 4·7	32 35 N.
1116	7788	30		5		22 14·4	5 11 N.
1117	7796	31		4½		22 15·6	11 36 N.
1118	7908	42	ζ	3		22 35·5	10 11 N.
1119	7914	43	ο	5		22 36·1	28 40 N.
1120	7923	44	η	3	Dup. u.	22 37·4	29 35 N.
1121	7943	46	ξ	5	Dup.(vi.) u.	22 40·7	11 33 N.
1122	7945	47	λ	4½		22 40·9	22 56 N.
1123	7958	48	μ	4		22 44·2	23 58 N.
1124	8032	53	β	2	Dup.	22 58·0	27 26 N.
1125	80 4	54	α	2	Dup.	22 58·8	14 34 N.
1126	8051	55		5		23 1·0	8 46 N.
1127	8052	56		4½		23 1·3	24 49 N.
1128	8131	62	τ	5		23 14·7	23 5 N.

PEGASUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1129	8160	68	υ	5		23 19·4	22 45 N.
1130	8182	70	q	5		23 23·1	12 6 N.
1131	8256	78		5		23 38·0	28 42 N.
1132	26	88	γ	2		0 7·0	14 31 N.
			PERSEUS.	*Perseus.*			
1133	721	9	i	5		2 14·0	55 18 N.
1134	827	13	θ	4	Trip.(vi.)u.	2 36·0	48 43 N.
1135	863	15	η	4	Dup.	2 41·9	55 24 N.
1136	871	16		4½		2 43·0	37 49 N.
1137	885	18	τ	5		2 45·8	52 16 N.
1138	912	22	π	5		2 51·1	39 11 N.
1139	947	23	γ	3½	Dup. u.	2 56·1	53 2 N.
1140	948			5		2 56·5	56 14 N.
1141	953	25	ρ	4		2 57·5	38 22 N.
1142	963	26	β	2½	Var.	3 0·3	40 30 N.
1143	962		ι	4		3 0·4	49 9 N.
1144	967	27	κ	5		3 1·4	44 24 N.
1145	981	28	ω	5		3 3·6	39 9 N.
1146	1043	33	α	2½		3 15·8	49 26 N.
1147	1071	35	σ	5		3 22·1	47 35 N.
1148	1099	37	ψ	5		3 28·0	47 48 N.
1149	1129	39	δ	3		3 34·4	47 24 N.
1150	1138	38	ο	4		3 36·8	31 54 N.
1151	1139	41	ν	4		3 37·0	42 12 N.
1152	1207	44	ζ	3½	Quad.	3 46·6	31 34 N.
1153	1219	45	ε	3½	Dup.	3 49·8	39 40 N.
1154	1228	46	ξ	5		3 51·2	35 27 N.
1155	1254	47	λ	4½		3 57·7	50 1 N.
1156	1266	48	c	5		4 0·0	47 24 N.
1157	1287	51	μ	4½	Dup. u.	4 6·1	48 6 N.
1158	1291	52	f	5		4 6·7	40 11 N.
1159	1301		b^1	5		4 9·2	50 0 N.
			PHŒNIX.	*The Phœnix.*			
1160	8210		ι	5		23 28·6	43 17 S.
1161	11		ε	4		0 3·3	46 24 S.
1162	93		κ	4		0 20·3	44 21 S.
1163	94		α	2		0 20·4	42 58 S.
1164	124		λ	5		0 25·6	49 28 S.

PHŒNIX—*continued.*

No.	B.A.C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1165	143			5		0 28·8	53 2 S.
1166	183		μ	5		0 35·6	46 44 S.
1167	188		ξ	5		0 36·2	57 10 S.
1168	199		η	5		0 37·9	58 8 S.
1169	317		β	3½		1 0·7	47 22 S.
1170	340		ζ	5		1 3·3	55 54 S.
1171	380		ν	4½		1 9·8	46 10 S.
1172	426			5		1 19·4	42 7 S.
1173	447		γ	3		1 23·2	43 56 S.
1174	461		δ	4		1 26·3	49 42 S.
1175	582			5		1 48·8	46 53 S.
1176	585		φ	5		1 49·4	43 5 S.
1177	634		χ	5		1 56·9	45 17 S.
	PICTOR. *The Painter's Easel.*						
1178	1473		λ	5		4 39·7	50 42 S.
1179	1672		ζ	5		5 16·4	50 44 S.
1180	1704		κ	5		5 20·2	56 15 S.
1181	1855			5		5 43·2	46 38 S.
1182	1861		β	4½		5 44·4	51 6 S.
1183	1884		γ	4½		5 47·6	56 11 S.
1184	1890			5		5 48·2	52 8 S.
1185	2260		α	4		6 47·0	61 49 S.
	PISCES. *The Fishes.*						
1186	8031	4	β	5		22 57·8	3 10 N.
1187	8105	6	γ	4½		23 11·0	2 38 N.
1188	8177	10	θ	5		23 21·9	5 43 N.
1189	8233	17	ι	4½		23 33·8	4 59 N.
1190	8243	18	λ	5		23 35·9	1 7 N.
1191	8328	27		5		23 52·5	4 13 S.
1192	8331	28	ω	4½		23 53·2	6 12 N.
1193	8346	29		5		23 55·7	3 42 S.
1194	8349	30		4½		23 55·8	6 41 S.
1195	8368	33		5		23 59·2	6 23 S.
1196	222	63	δ	5		0 42·5	6 56 N.
1197	288	71	ε	4		0 56·7	7 15 N.
1198	328	80	e	5		1 2·2	5 1 N.
1199	348	84	χ	5		1 5·0	20 24 N.
1200	427	93	ρ	5		1 19·8	18 33 N.

PISCES—*continued.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1201	431	94		5		1 20·2	18 37 N.
1202	448	98	μ	4½		1 23·9	5 31 N.
1203	453	99	η	4		1 25·1	14 44 N.
1204	488	102	π	5		1 30·7	11 32 N.
1205	518	106	ν	5		1 35·2	4 53 N.
1206	537	110	ο	5		1 39·1	8 33 N.
1207	625	113	α	3½	Dup. (iii.)	1 55·9	2 11 N.

PISCIS AUSTRALIS. *The Southern Fish.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1208	7386	4		5		21 10·7	32 40 S.
1209	7557	9	ι	4½		21 37·8	33 34 S.
1210	7583	10	θ	5		21 40·7	31 27 S.
1211	7657	12	η	5		21 53·9	29 2 S.
1212	7842	17	β	4		22 24·7	32 58 S.
1213	7898	18	ε	4		22 34·0	27 40 S.
1214	7966	22	γ	5		22 45·9	33 31 S.
1215	7992	24	α	1	Dup. u.	22 51·0	30 16 S.

PISCIS VOLANS. *The Flying Fish.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1216	2400		γ	5	Dup. (vi.)	7 9·8	70 18 S.
1217	2447		δ	5		7 16·9	67 44 S.
1218	2607		ζ	5		7 43·3	72 20 S.
1219	2773		ε	5		8 7·6	68 16 S.
1220	2856		η	5		8 23·1	73 0 S.
1221	2863		β	5		8 24·4	65 44 S.
1222	3114		α	4½		9 0·6	65 55 S.

RETICULUM. *The Net.*

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1223	1197		β	4		3 42·4	65 11 S.
1224	1259		δ	5		3 56·9	61 45 S.
1225	1270		γ	5		3 59·2	62 29 S.
1226	1271		ι	5		3 59·4	61 25 S.
1227	1336		α	3½		4 12·9	62 47 S.
1228	1344		ε	5		4 14·4	59 36 S.
1229	1358		θ	5		4 16·0	63 33 S.
1230	1383		η	5		4 20·6	63 40 S.

SAGITTA.

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	SAGITTA. *The Arrow.*					h. m.	° ′
1231	6739	5	α	4		19 34·7	17 44 N.
1232	6744	6	β	5		19 35·7	17 12 N.
1233	6783	7	δ	4		19 42·1	18 14 N.
1234	6794	8	ζ	5		19 43·7	18 51 N.
1235	6858	12	γ	4½		19 53·4	19 10 N.
	SAGITTARIUS. *The Archer.*						
1236	6008	3		5		17 40·0	27 47 S.
1237	6074			5		17 51·4	30 14 S.
1238	6077	4		5		17 52·5	23 48 S.
1239	6107		γ^1	4		17 57·4	29 35 S.
1240	6115	10	γ^2	4		17 58·1	30 25 S.
1241	6127			5		18 0·5	28 28 S.
1242	6168	13	μ	3½		18 6·6	21 5 S.
1243	6186		η	4		18 9·5	36 48 S.
1244	6209	19	δ	3½		18 13·3	29 53 S.
1245	6233	20	ε	3		18 16·2	34 26 S.
1246	6263	22	λ	4		18 20·6	25 29 S.
1247	6279			5		18 22·4	14 39 S.
1248	6371	27	φ	4½		18 38·2	27 7 S.
1249	6434	32	ν^1	5		18 46·9	22 53 S.
1250	6440	34	σ	3		18 47·8	26 27 S.
1251	6441	35	ν^2	5		18 47·9	22 49 S.
1252	6461	37	ξ^2	4		18 50·6	21 16 S.
1253	6489	38	ζ	3½		18 55·0	30 3 S.
1254	6507	39	ο	4½		18 57·5	21 55 S.
1255	6521	40	τ	4		18 59·5	27 51 S.
1256	6548	41	π	4½		19 2·6	21 13 S.
1257	6575	42	ψ	5		19 8·2	25 28 S.
1258	6584	43	*d*	5		19 10·6	19 10 S.
1259	6608		β^1	3½		19 14·0	44 41 S.
1260	6610		β^2	4		19 14·5	45 2 S.
1261	6619	44	ρ^1	5		19 14·7	18 4 S.
1262	6622		α	4		19 15·6	40 51 S.
1263	6706	52	h^2	4½		19 29·4	25 9 S.
1264	6742	55	e^2	5		19 35·7	16 24 S.
1265	6812		ι	4½		19 47·0	42 11 S.
1266	6832	59	*b*	5		19 49·6	27 29 S.
1267	6870	62	*c*	4½		19 55·3	28 3 S.
1268	6877			5		19 56·7	32 23 S.

SCORPIO.

No.	B.A.C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
	SCORPIO. *The Scorpion.*						
						h. m.	° ′
1269	5232	1	*b*	5		15 43·8	25 23 S.
1270	5250	2	A	5		15 46·4	24 58 S.
1271	5272	5	ρ	4		15 49·5	28 52 S.
1272	5289	6	π	3½		15 51·6	25 46 S.
1273	5303	7	δ	3		15 53·2	22 17 S.
1274	5329	8	β^1	2	Dup. (vi.)	15 58·5	19 29 S.
1275	5337	9	ω^1	4½		15 59·8	20 21 S.
1276	5342	10	ω^2	4½		16 0·4	20 33 S.
1277	5347			5		16 0·8	26 0 S.
1278	5381	13	c^2	5		16 4·9	27 37 S.
1279	5382	14	ν	4	Dup. (i.)	16 5·0	19 9 S.
1280	5386	15	ψ	5		16 5·4	9 45 S.
1281	5420	18		5		16 9·1	8 3 S.
1282	5447	20	σ	4	Dup.	16 13·9	25 18 S.
1283	5498	21	α	1	Dup.(iii.)u.	16 22·1	26 10 S.
1284	5508			4		16 23·5	34 27 S.
1285	5539	23	τ	3½		16 28·4	27 58 S.
1286	5538			5		16 28·5	35 1 S.
1287	5632	26	ϵ	3		16 42·4	34 5 S.
1288	5638		μ^1	3		16 43·8	37 50 S.
1289	5640		μ^2	4		16 44·2	37 49 S.
1290	5651		ζ^1	4½		16 45·5	42 10 S.
1291	5661		ζ^2	3		16 46·1	42 9 S.
1292	5735			5		16 56·4	33 57 S.
1293	5778		η	3½		17 3·6	43 5 S.
1294	5901	34	υ	3½		17 22·6	37 12 S.
1295	5915	35	λ	3		17 25·5	37 1 S.
1296	5935		θ	3		17 28·7	42 55 S.
1297	5970		κ	3		17 34·2	38 58 S.
1298	6004		ι^1	3½		17 39·2	40 5 S.
1299	6018			4		17 41·7	37 0 S.
	SCULPTOR. *The Sculptor's Workshop.*						
1300	8113		λ	5		23 12·3	33 11 S.
1301	8201		β	5		23 26·5	38 19 S.
1302	8275		δ	5		23 42·7	28 48 S.
1303	72		ι	5		0 15·5	29 39 S.
1304	103			5		0 22·0	33 40 S.
1305	192		λ^1	5		0 36·9	39 7 S.

SCULPTOR—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1306	202		λ^2	5		0 38·4	39 5 S.
1307	272		α	5		0 52·8	30 0 S.
1308	541		ϵ	5		1 40·0	25 39 S.
	SERPENS. *The Serpent.*						
1309	5135	13	δ	3	Dup. (iii.)	15 29·1	10 57 N.
1310	5187	21	ι	5		15 36·2	20 3 N.
1311	5196	24	α	2½	Dup. u.	15 38·4	6 48 N.
1312	5214	27	λ	4½		15 40·6	7 44 N.
1313	5216	28	β	3½	Dup.	15 40·7	15 48 N.
1314	5234	35	κ	4		15 43·3	18 31 N.
1315	5230	32	μ	3½		15 43·4	3 4 S.
1316	5245	37	ϵ	3		15 44 8	4 50 N.
1317	5252	38	ρ	4½		15 46·0	21 20 N.
1318	5284	41	γ	3		15 50·9	16 3 N.
1319	5322	44	π	4½		15 57·1	23 8 N.
1320	5456	50	σ	5		16 16·0	1 19 N.
1321	5845	53	ν	4½		17 14·1	12 43 S.
1322	5949	55	ξ	5		17 30·7	15 19 S.
1323	5976	56	o	4½		17 34·7	12 49 S.
1324	6085	57	ζ	5		17 54·2	3 41 S.
1325	6229	58	η	4		18 15·1	2 56 S.
1326	6460	63	θ^1	4½	} Dup. (vii.)	18 50·2	4 3 N.
1327	6462		θ^2	5		18 50·3	4 3 N.
	SEXTANS. *The Sextant.*						
1328	3458	15		5		10 1·8	0 13 N.
	TAURUS. *The Bull.*						
1329	1057	1	o	4½		3 18·4	8 36 N.
1330	1068	2	ξ	4		3 20·7	9 19 N.
1331	1112	10		4½		3 30·8	0 1 N.
1332	1147	17		4½	Pleiad.	3 37·8	23 44 N.
1333	1151	19		5	Pleiad. Dup.	3 38·1	24 5 N.
1334	1154	20		5	Pleiad.	3 38·7	24 0 N.
1335	1161	23		5	Pleiad.	3 39·2	23 34 N.
1336	1166	25	η	3	Pleiad.	3 40·4	23 44 N.
1337	1174	30	e	5		3 41·7	10 46 N.
1338	1176	27		5	Pleiad.	3 42·0	23 41 N.

TAURUS—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1339	1241	35	λ	4	Var.	3 54·0	12 9 N.
1340	1251	38	ν	5		3 56·8	5 39 N.
1341	1257	37	A^1	5		3 57·6	21 45 N.
1342	1304	49	μ	5		4 9·0	8 36 N.
1343	1328	54	γ	3½	Dup. u.	4 13·0	15 20 N.
1344	1326	52	φ	5	Dup.	4 13·0	27 4 N.
1345	1346	61	δ^1	4		4 16·0	17 15 N.
1346	1356	64	δ^2	4½		4 17·2	17 10 N.
1347	1365	68	δ^3	5		4 18·6	17 39 N.
1348	1367	69	υ^1	5		4 19·1	22 32 N.
1349	1370	73	π	5		4 19·8	14 26 N.
1350	1376	74	ε	3½		4 21·6	18 55 N.
1351	1380	77	θ^1	4½	Dup.	4 21·7	15 42 N.
1352	1381	78	θ^2	4½	Dup.	4 21·8	15 36 N.
1353	1409	86	ρ	5		4 27·0	14 35 N.
1354	1420	87	α	1		4 29·0	16 16 N.
1355	1421	88	*d*	5		4 29·1	9 55 N.
1356	1434	90	c^1	5		4 31·5	12 16 N.
1357	1442	93	c^2	5		4 33·4	11 58 N.
1358	1449	94	τ	5	Dup.	4 35·0	22 44 N.
1359	1551	102	ι	4½		4 55·9	21 25 N.
1360	1681	112	β	2	Dup. u.	5 18·7	28 30 N.
1361	1695	114	ο	5		5 20·4	21 50 N.
1362	1767	123	ζ	3½		5 30·5	21 4 N.
1363	1837	132		5		5 41·7	24 33 N.
1364	1863	136		4½		5 45·8	27 36 N.

TELESCOPIUM. *The Telescope.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1365	6140		ε	4½		18 2·3	45 58 S.
1366	6240		α	4		18 18·1	46 2 S.
1367	6250		ζ	4½		18 19·6	49 8 S.
1368	6278		δ^1	5		18 22·9	46 0 S.
1369	6282		δ^2	5		18 23·2	45 50 S.
1370	6649		μ	4		19 19·9	55 21 S.

TOUCAN. *The Toucan.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1371	7767		α	3		22 10·3	60 51 S.
1372	7808		δ	5		22 18·8	65 35 S.
1373	7841		ν	5		22 24·9	62 36 S.
1374	8093			5		23 9·5	62 38 S.

URSA MINOR—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1447	4732			5		14 9·9	70 0 N.
1448	4822	5		4	Dup.	14 27·8	76 14 N.
1449	4936	7	β	3	Dup. Var.	14 51·1	74 39 N.
1450	4982			5		14 58·4	83 1 N.
1451	5079	11		5		15 17·2	72 15 N.
1452	5094	13	γ	3½		15 20·9	72 16 N.
1453	5191	15	θ	5		15 35·0	77 45 N.
1454	5285	16	ζ	4		15 50·7	78 10 N.
1455	5462	19		5		16 14·2	76 11 N.
1456	5511	21	η	5		16 21·0	76 2 N.
1457	5780	22	ε	4		16 58·3	82 14 N.
1458	6281	23	δ	3	Dup. u.	18 11·0	86 37 N.
1459	6999		λ	5		19 44·2	88 57 N.
1460	7184			5		20 15·5	88 46 N.
1461	7851			5½		22 22·7	85 30 N.
1462	8213			5½		23 27·8	86 39 N.

VIRGO. *The Virgin.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1463	3979	2	ξ	5		11 39·1	8 55 N.
1464	3982	3	ν	4½		11 39·7	7 12 N.
1465	4002	5	β	3½	Dup. u.	11 44·4	2 27 N.
1466	4052	8	π	5		11 54·7	7 17 N.
1467	4072	9	ο	4½		11 59·1	9 24 N.
1468	4145	15	η	3½		12 13·8	0 0
1469	4151	16	c	5		12 14·3	3 59 N.
1470	4257	26	χ	5		12 33·1	7 20 S.
1471	4268	29	γ	4	Dup. (iv.)	12 35·6	0 47 S.
1472	4271	30	ρ	5		12 35·8	10 54 N.
1473	4330	40	ψ	5		12 48·1	8 53 S.
1474	4340	43	δ	3	Dup. u.	12 49·6	4 3 N.
1475	4367	47	ε	3	Dup. u.	12 56·2	11 36 N.
1476	4391	49	g	5		13 1·6	10 6 S.
1477	4401	51	θ	4½	Trip.	13 3·7	4 54 S.
1478	4418	53		5		13 5·7	15 33 S.
1479	4449	61		4½		13 12·1	17 38 S.
1480	4480	67	α	1	Dup. u.	13 18·9	10 32 S.
1481	4492	68	i	5		13 20·4	12 5 S.
1482	4532	79	ζ	4		13 28·6	0 1 N.
1483	4672	93	τ	4½		13 55·6	2 7 N.
1484	4716	98	κ	4		14 6·5	9 43 S.
1485	4727	99	ι	4		14 9·7	5 26 S.

VIRGO—*continued.*

No.	B. A. C.	Flam-steed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1486	4743	100	λ	4		14 12·6	12 49 S.
1487	4792	105	φ	5	Dup.(iv.)u.	14 22·0	1 41 S.
1488	4855	107	μ	4½		14 36·7	5 8 S.
1489	4878	109		4		14 40·2	2 24 N.
1490	4951	110		5		14 56·8	2 34 N.
	VOLANS. *See* PISCIS VOLANS.						
	VULPECULA. *The Fox.*						
1491	6589	1		5		19 11·1	21 11 N.
1492	6674	6	α	4		19 23·7	24 25 N.
1493	6827	13		5		19 48·4	23 46 N.
1494	6866	14		5		19 54·0	22 46 N.
1495	6879	15		5		19 56·2	27 26 N.
1496	6882			5		19 56·7	24 28 N.
1497	6966			5		20 10·2	25 14 N.
1498	6973	23		4½		20 10·8	27 27 N.
1499	6979	24		5		20 11·7	24 18 N.
1500	7256	32		4½		20 49·5	27 36 N.

URSA MINOR—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1447	4732			5		14 9·9	70 0 N.
1448	4822	5		4	Dup.	14 27·8	76 14 N.
1449	4936	7	β	3	Dup. Var.	14 51·1	74 39 N.
1450	4982			5		14 58·4	83 1 N.
1451	5079	11		5		15 17·2	72 15 N.
1452	5094	13	γ	3½		15 20·9	72 16 N.
1453	5191	15	θ	5		15 35·0	77 45 N.
1454	5285	16	ζ	4		15 50·7	78 10 N.
1455	5462	19		5		16 14·2	76 11 N.
1456	5511	21	η	5		16 21·0	76 2 N.
1457	5780	22	ε	4		16 58·3	82 14 N.
1458	6281	23	δ	3	Dup. u.	18 11·0	86 37 N.
1459	6999		λ	5		19 44·2	88 57 N.
1460	7184			5		20 15·5	88 46 N.
1461	7851			5½		22 22·7	85 30 N.
1462	8213			5½		23 27·8	86 39 N.

VIRGO. *The Virgin.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
1463	3979	2	ξ	5		11 39·1	8 55 N.
1464	3982	3	ν	4½		11 39·7	7 12 N.
1465	4002	5	β	3½	Dup. u.	11 44·4	2 27 N.
1466	4052	8	π	5		11 54·7	7 17 N.
1467	4072	9	ο	4½		11 59·1	9 24 N.
1468	4145	15	η	3½		12 13·8	0 0
1469	4151	16	c	5		12 14·3	3 59 N.
1470	4257	26	χ	5		12 33·1	7 20 S.
1471	4268	29	γ	4	Dup. (iv.)	12 35·6	0 47 S.
1472	4271	30	ρ	5		12 35·8	10 54 N.
1473	4330	40	ψ	5		12 48·1	8 53 S.
1474	4340	43	δ	3	Dup. u.	12 49·6	4 3 N.
1475	4367	47	ε	3	Dup. u.	12 56·2	11 36 N.
1476	4391	49	g	5		13 1·6	10 6 S.
1477	4401	51	θ	4½	Trip.	13 3·7	4 54 S.
1478	4418	53		5		13 5·7	15 33 S.
1479	4449	61		4½		13 12·1	17 38 S.
1480	4480	67	α	1	Dup. u.	13 18·9	10 32 S.
1481	4492	68	i	5		13 20·4	12 5 S.
1482	4532	79	ζ	4		13 28·6	0 1 N.
1483	4672	93	τ	4½		13 55·6	2 7 N.
1484	4716	98	κ	4		14 6·5	9 43 S.
1485	4727	99	ι	4		14 9·7	5 26 S.

VIRGO—*continued.*

No.	B. A. C.	Flamsteed	Letter	Magn.	Note	Right Ascension	Declination
						h. m.	° ′
1486	4743	100	λ	4		14 12·6	12 49 S.
1487	4792	105	φ	5	Dup.(iv.)u.	14 22·0	1 41 S.
1488	4855	107	μ	4½		14 36·7	5 8 S.
1489	4878	109		4		14 40·2	2 24 N.
1490	4951	110		5		14 56·8	2 34 N.
	VOLANS. *See* Piscis Volans.						
	VULPECULA. *The Fox.*						
1491	6589	1		5		19 11·1	21 11 N.
1492	6674	6	α	4		19 23·7	24 25 N.
1493	6827	13		5		19 48·4	23 46 N.
1494	6866	14		5		19 54·0	22 46 N.
1495	6879	15		5		19 56·2	27 26 N.
1496	6882			5		19 56·7	24 28 N.
1497	6966			5		20 10·2	25 14 N.
1498	6973	23		4½		20 10·8	27 27 N.
1499	6979	24		5		20 11·7	24 18 N.
1500	7256	32		4½		20 49·5	27 36 N.

TABLE II.

STAR-NAMES.

α Andromedæ, *Alpheratz*
β ———, *Mirach, Mizar*
γ ———, *Almach*
β Aquarii, *Sadalsund*
α ———, *Sadalmelik*
δ ———, *Skat*
γ Aquilæ, *Tarazed*
α ———, *Altair*
β ———, *Alshain*
α Argûs, *Canopus*
γ Arietis, *Mesartim*
β ———, *Sheratan*
α ———, *Hamal*
α Aurigæ, *Capella*
β ———, *Menkalinan*
η Bootis, *Muphrid*
α ———, *Arcturus*
ε ———, *Izar, Mizar, Mirach, Pulcherissima* *
β ———, *Nekkar*
α Canum Ven., *Cor Caroli*
β Canis Majoris, *Mirzam*
α ———, *Sirius*
ε ———, *Adara*
β Canis Minoris, *Gomeisa*
α ———, *Procyon*
$α^2$ Capricorni, *Secunda Giedi*
δ ———, *Deneb Algiedi*
β Cassiopeiæ, *Chaph*
α ———, *Schedar*
α Cephei, *Alderamin*
β Cephei, *Alphirk*
γ ———, *Errai*
β Ceti, *Diphda*
ζ ———, *Baten Kaitos*
ο ———, *Mira*
α ———, *Menkar*
α Columbæ, *Phact*
α Coronæ Bor., *Alphecca*
α Corvi, *Alchiba*
δ ———, *Algores*
α Crateris, *Alkes*
β Cygni, *Albireo*
α ———, *Arided, Deneb Adige*
$π^1$———, *Azelfafage*
α Delphini, *Svalocin*
α Draconis, *Thuban*
β ———, *Alwaid*
γ ———, *Etanin*
α Eridani, *Achernar*
$γ^1$ ———, *Zaurac*
β ———, *Cursa*
γ Geminorum, *Alhena*
ε ———, *Mebsuta*
δ ———, *Wasat*
$α^2$———, *Castor*
β ———, *Pollux*
κ Herculis, *Marsic*
β ———, *Korneforos*
α ———, *Ras Algethi*
α Hydræ, *Alphard, Cor Hydræ*
α Leonis, *Regulus, Cor Leonis*

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* A name given by modern astronomers to express the extreme beauty of this double star (orange and green), viewed with a good telescope.

γ^1 Leonis, *Algeiba*
δ ———, *Zosma*
β ———, *Deneb Aleet, Denebola, Deneb*
α Leporis, *Arneb*
α Libræ, *Zuben el Genubi*
β ———, *Zuben el Chamali*
γ ———, *Zuben Hakrabi*
α Lyræ, *Vega*
β ———, *Sheliak*
γ ———, *Sulaphat*
α Ophiuchi, *Ras Alhague*
β ———, *Cebalrai*
β Orionis, *Rigel*
γ ———, *Bellatrix*
δ ———, *Mintaka*
ϵ ———, *Alnilam*
α ———, *Betelgeux*
ϵ Pegasi, *Enif*
ζ ———, *Homan*
β ———, *Scheat*
α ———, *Markab*
γ ———, *Algenib*
β Persei, *Algol*
α ———, *Mirfak*
α Piscis Aust., *Fomalhaut*
ϵ Sagittarii, *Kaus Australis*
α Scorpionis, *Antares, Cor Scorpionis*
α Serpentis, *Unukalhai*
η Tauri, *Alcyone* (Pleiad)
α ———, *Aldeboran*
β ———, *Nath*
ι Ursæ Majoris, *Talitha*
α ———, *Dubhe*
β ———, *Merak*
γ ———, *Phecda*
ϵ ———, *Alioth*
ζ ———, *Mizar*
80 ———, *Alcor*
η ———, *Alkaid, Benetnasch*
α Ursæ Minoris, *Polaris*
β ———, *Kochab*
β Virginis, *Zavijava*
ϵ ———, *Vindemiatrix*
α ———, *Spica Azimech, Spica*

FOR DETERMINING THE P[illegible]

NOTE.—The nineteen central columns indicate [illegible] spaces.

R.A.		0° 0h 0m	5° 0h 20m	10° 0h 40m	15° 1h 0m	20° 1h 20m		90° 6h 0m	The R.A.'s opposite this space are to be taken with the left-hand column of N.P.D.'s and Dec.'s.	
Ann. Var. in N.P.D.		∓19″·9	∓19″·9	∓19″·6	∓19″·3	∓18″·7		∓0″·0		
R.A.		12h 0m 180°	11h 40m 175°	11h 20m 170°	11h 0m 165°	10h 40m 160°		6h 0m 90°		
N.P.D.	Decn.									
°	°			At points very near the north [illegible]					°	°
0	90 N.	s.	s.	s.	s.	s.		s.	90 S.	180
5	85 N.	+3·06	+4·39	+5·70	+7·00	+8·26	0	+18·26	85 S.	175
10	80 N.	3·06	3·72	4·37	5·01	5·64	7	10·60	80 S.	170
15	75 N.	3·06	3·50	3·93	4·35	4·76	1	8·03	75 S.	165
20	70 N.	3·06	3·38	3·70	4·01	4·31	0	6·72	70 S.	160
25	65 N.	3·06	3·31	3·56	3·80	4·04	0	5·92	65 S.	155
30	60 N.	3·06	3·26	3·46	3·66	3·85	6	5·37	60 S.	150
35	55 N.	3·06	3·23	3·39	3·56	3·71	6	4·96	55 S.	145
40	50 N.	3·06	3·20	3·34	3·47	3·61	4	4·65	50 S.	140
45	45 N.	3·06	3·18	3·29	3·41	3·52	9	4·39	45 S.	135
50	40 N.	3·06	3·16	3·26	3·35	3·45	8	4·18	40 S.	130
55	35 N.	3·06	3·15	3·23	3·30	3·38	9	3·99	35 S.	125
60	30 N.	3·06	3·13	3·20	3·26	3·33	3	3·83	30 S.	120
65	25 N.	3·06	3·12	3·17	3·22	3·28	8	3·68	25 S.	115
70	20 N.	3·06	3·11	3·15	3·19	3·23	5	3·55	20 S.	110
75	15 N.	3·06	3·10	3·13	3·16	3·19	2	3·42	15 S.	105
80	10 N.	3·06	3·08	3·10	3·12	3·14	0	3·30	10 S.	100
85	5 N.	3·06	3·07	3·08	3·09	3·10	8	3·18	5 S.	95
90	0	3·06	3·06	3·06	3·06	3·06	6	3·06	0	90
95	5 S.	3·06	3·05	3·04	3·03	3·02	5	2·95	5 N.	85
100	10 S.	3·06	3·04	3·02	3·00	2·98	3	2·83	10 N.	80
105	15 S.	3·06	3·03	3·00	2·97	2·94	1	2·71	15 N.	75
110	20 S.	3·06	3·02	2·98	2·94	2·90	8	2·58	20 N.	70
115	25 S.	3·06	3·01	2·96	2·90	2·85	5	2·44	25 N.	65
120	30 S.	3·06	3·00	2·93	2·87	2·80	0	2·30	30 N.	60
125	35 S.	3·06	2·98	2·90	2·82	2·75	4	2·13	35 N.	55
130	40 S.	3·06	2·97	2·87	2·78	2·68	5	1·95	40 N.	50
135	45 S.	3·06	2·95	2·83	2·72	2·61	4	1·73	45 N.	45
140	50 S.	3·06	2·93	2·79	2·65	2·52	9	1·48	50 N.	40
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180	90 S.								90 N.	0
°	°			At points very near the south [illegible]					°	°
									Decn.	N.P.D.
The R.A.'s opposite this space are to be taken with the right-hand column of N.P.D.'s and Dec.'s.		180° 12h 0m	185° 12h 20m	190° 12h 40m	195° 13h 0m	200° 13h 20m	0m	270° 18h 0m	R.A.	
		±19″·9	±19″·9	±19″·6	±19″·3	±18″·7	7	±0″·0	Ann. Var. in N.P.D.	
		24h 0m 360°	23h 40m 355°	23h 20m 350°	23h 0m 345°	22h 40m 340°	0m	18h 0m 270°	R.A.	

TABLE IV.—*Dimensions of the Strip of a Globe, included between an Arc of 5° of the Equator and Quadrants of two Meridians, crossed by Declination parallels 5° apart.*

N. P. D.	Length of arc of 5° of R.A., arc at Equator being taken as 1.	Distance of point of convergence of meridians bounding arc of 5° of R.A.	Dec.	Figures of developed strips of Globe.	Dec.	Angle between meridians bounding arc of 5° of R.A.	Area included between meridians and Dec.-parallels 5° apart.	N. P. D.
0°	0·000	0·000	90°	Fig. 6.	90°	5° 0′		180°
							0·044	
5	0·087	1·003	85		85	4 59		175
							0·131	
10	0·174	2·021	80		80	4 55		170
							0·217	
15	0·259	3·070	75		75	4 50		165
							0·301	
20	0·342	4·171	70		70	4 42		160
							0·383	
25	0·423	5·343	65		65	4 32		155
							0·462	
30	0·500	6·616	60		60	4 20		150
							0·538	
35	0·574	8·024	55		55	4 6		145
							0·609	
40	0·643	9·615	50		50	3 50		140
							0·676	
45	0·707	11·459	45		45	3 32		135
							0·738	
50	0·766	13·656	40		40	3 13		130
							0·794	
55	0·819	16·365	35		35	2 52		125
							0·844	
60	0·866	19·848	30		30	2 30		120
							0·888	
65	0·906	24·574	25		25	2 7		115
							0·925	
70	0·940	31·484	20		20	1 43		110
							0·954	
75	0·966	42·766	15		15	1 17		105
							0·977	
80	0·985	64·988	10		10	0 52		100
							0·992	
85	0·996	130·979	5		5	0 26		95
							1·000	
90	1·000	Infinity	0		0	0 0		90

TABLE V.—*Showing the Points in which the Ecliptic crosses the Meridians.*

R. A. of Merⁿ.	h. m. 0 0 12 0	h. m. 0 20 11 40	h. m. 0 40 11 20	h. m. 1 0 11 0	h. m. 1 20 10 40	h. m. 1 40 10 20	h. m. 2 0 10 0	h. m. 2 20 9 40	h. m. 2 40 9 20	h. m. 3 0 9 0	h. m. 3 20 8 40	h. m. 3 40 8 20	h. m. 4 0 8 0	h. m. 4 20 7 40	h. m. 4 40 7 20	h. m. 5 0 7 0	h. m. 5 20 6 40	h. m. 5 40 6 20	h. m. 6 0 6 0
Dec. of Ecliptic, north for upper, south for lower, rows of R.A.'s.	N. 0° 0′ S.	N. 2° 10′ S.	N. 4° 19′ S.	N. 6° 24′ S.	N. 8° 26′ S.	N. 10° 23′ S.	N. 12° 14′ S.	N. 13° 59′ S.	N. 15° 35′ S.	N. 17° 3′ S.	N. 18° 23′ S.	N. 19° 34′ S.	N. 20° 36′ S.	N. 21° 28′ S.	N. 22° 11′ S.	N. 22° 44′ S.	N. 23° 8′ S.	N. 23° 23′ S.	N. 23° 27′ S.
R. A. of Merⁿ.	h. m. 12 0 24 0	h. m. 12 20 23 40	h. m. 12 40 23 20	h. m. 13 0 23 0	h. m. 13 20 22 40	h. m. 13 40 22 20	h. m. 14 0 22 0	h. m. 14 20 21 40	h. m. 14 40 21 20	h. m. 15 0 21 0	h. m. 15 20 20 40	h. m. 15 40 20 20	h. m. 16 0 20 0	h. m. 16 20 19 40	h. m. 16 40 19 20	h. m. 17 0 19 0	h. m. 17 20 18 40	h. m. 17 40 18 20	h. m. 18 0 18 0

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